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ABSTRACT

This final report describes activities and accomplishments of a 3-year project which analyzed the speech and related behaviors of 28 young children (mean age 52.5 months) who stuttered, their mothers, and similar non-stuttering children and mothers. A loosely structured conversation between each mother and child was recorded and analyzed. In addition to appreciable group differences in disfluencies, the study found that stuttering children exhibited significantly more of three nonspeech behaviors: eyelid blinking, eyeball movement to the left, and upper lip raising. The study also found that eye contact between mothers and young stutterers was significantly more frequent during stuttering than for normally fluent peers, and that mothers of stutterers produced significantly more nonspeech behaviors including eye blinks and various lip movements during stuttering incidents than at other times. One of the analyses found that the 15 most commonly occurring nonspeech behaviors of mothers of stutterers were very similar to the 21 most commonly occurring nonspeech behaviors of young nonstutterers. Results suggest the importance of understanding the nature and potential bi-directional influences of these nonverbal behaviors in any theory or therapy attempting to account for the onset and development of stuttering. Attached are eight papers published about the study: (1) "Young Stutterers' Nonspeech Behaviors during Stuttering" (Edward G. Conture and Ellen M. Kelly); (2) "Behaviors at the Onset of Stuttering" (Howard D. Schwartz and others); (3) "Eye Contact between Young Stutterers and Their Mothers" (Lisa R. LaSalle and Edward G. Conture); (4) "Childhood Stuttering: What Is It and Who Does It?" (Edward G. Conture); (5) "The Child Who Stutters: to the Pediatrician"; "(6) "Stuttering" (Edward G. Conture and Lesley Wolk); (7) "Intervention with School-Age Stutters: A Parent-Child Fluency Group Approach" (Ellen M. Kelly and Edward G. Conture); (8) "Comorbidity of Stuttering and Disordered Phonology in Young Children" (Lesley Wolk and others). Individual papers contain references. (DB)

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Division of Special Education and Rehabilitation

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(NON) VERBAL BEHAVIOR OF YOUNG STUTTERERS AND THEIR MOTHERS

FINAL REPORT

OSEP Field-initiated Research Grant

# HO23C80008

Principal Investigator: Edward G. Conture

Institution: Syracuse University

Date: December 1, 1991

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Overview of Work Published, In Press, In Preparation or Presented (1988 - 1991)

From the beginning (9/1/88) to end (8/31/91) of the referenced project, the speech and related behaviors of 56 children and their mothers were collected and analyzed. During this time period, 24 studies were published, in press or presented with 22 of these being directly pertinent to the referenced project (a representative sample of 8 of these are attached to this report). Findings from this funded project also resulted in 42 presentations at various professional conferences throughout the USA and Canada as well as Denmark (Skallerup Klit), England (Oxford), Germany (Willingen), The Netherlands (Nijmegen and Rotterdam), and Sweden (Sund and Stockholm). Works published, in press, in preparation or presented are listed below.

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Conture, Edward G.
Final Report
OSEP Grant #HO23C8008
12/1/91

Works Published In Press, or Submitted (1988-1991): 24 in total

Caruso, A., Conture, E. & Colton, R. (1988) Selected temporal parameters of coordination associated with stuttering in children. Journal of Fluency Disorders, 13, 57-82.

Schwartz, H. & Conture, E. (1988). Subgrouping young stutterers: Preliminary behavioral perspectives. Journal of Speech and Hearing Research, 31, 62-71.

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Colton, R., Casper, J. Brewer, D. & Conture, E., (1989). Digital processing of laryngeal images: A preliminary report. Journal of Voice, 3, 132-142.

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Conture, E. & Wolk, L. (1990). Efficacy of intervention by speech-language pathologists: Stuttering. Seminars in Speech and Language, 11, 200-211.

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Louko, L. Edwards, M.L. & Conture, E. (1990). Phonological characteristics of young stutterers and their normally fluent peers: Preliminary observations. Journal of Fluency Disorders, 15, 191-210.

Conture, E. & Kelly, E. (1991). Young stutterers' speech production: Some clinical implications. In L. Rustin (Ed.), Parents, families and stuttering children. Kibworth, England: Far Communications (pp. 25-39).

Guitar, B. & Conture, E. (1991). The child who stutters: To the pediatrician. Memphis, TN: Stuttering Foundation of America.

Conture, E. & Kelly, E. (1991). Young stutterers' nonspeech behavior during stuttering. Journal of Speech and Hearing Research, 34, 1041-1056.

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Conture, E. & Louko, L. (1991). Concomitant problems of young stutterers: Assessment and management issues. Manuscript submitted for publication.

LaSalle, L. & Conture, E. (1991). Eye contact between young stutterers and their mothers. Manuscript submitted for publication.

Work Presented (1988-1991): 42 in total

Conture, E. Therapy for young stutterers and their families. Workshop, Lincoln Institute of Health Sciences, Melbourne, AUSTRALIA (1988).

Conture, E. Evaluation and remediation of stuttering in children. Workshop, University of Queensland, St. Lucia, AUSTRALIA (1988).

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Conture, E. Remediation of Stuttering in Children. University of Northern Illinois, Dekalb, ILLINOIS (1988).

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Conture, E. Clinical management of stuttering in children. Introductory and advanced workshops, Erasmus University, Rotterdam, THE NETHERLANDS (1990).

Conture, E. Young stutterers' speech production: A critical review. Keynote address, Second Nijmegen Conference on Speech Motor Control and Stuttering, Nijmegen University, Nijmegen, THE NETHERLANDS (1990).

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Conture, E. Hard questions and no easy answers: Designing treatment for "real" not "ideal" children who stutter. Workshop, the University of Nijmegen, Nijmegen, THE NETHERLANDS (1991).

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Conture, E. Remediation: Older children and teenagers who stutter. State-wide teleconference to Purdue University, West Lafayette, INDIANA (1991).

Conture, E. & Louko, L. Concomitant Problems of young stutterers: Assessment and management issues. Paper presentation to Conference on Fluency Therapy: Preschoolers and School-Aged Children, Adolescents & Adults, Kent State University, Kent, OHIO (1991).

Kolk, H., Conture, E., Postma, A. & Louko, L. The cover-repair hypothesis and childhood stuttering. Miniseminar, Annual Conference of America Speech Language and Hearing Association. Atlanta, GEORGIA (1991).

Schwartz, H. et al presenters; Adams, M. & Conture, E. reactors. Childhood stuttering: Tough questions, experts respond. Miniseminar Annual Conference of America Speech Language and Hearing Association. Atlanta, GEORGIA (1991).

LaSalle, L. & Conture, E. Eye contact between young stutterers and their mothers during stuttering. Paper presentation, Annual Conference of America Speech Language and Hearing Association. Atlanta, GEORGIA (1991).

Overview of Results

We will not detail in this space information which has been or will be contained in published works listed above (e.g., Conture & Kelly, 1991; Schwartz, Zebrowski, & Conture, 1990). Rather we will provide sufficient detail subjects and methods to provide the general background for of the project's main outcome.

Age and sex of subjects. The basic study supported by this project involved 28 young stutterers (24 males and 4 females; mean age = 52.5 months [SD = 11.8 months]) and 28 age- (+/- 4 months) and sex-matched nonstuttering children (24 boys and 4 girls; mean age = 52.0 months [SD = 12.1 months]). Data were also collected from 6 other children (3 "stutterers" and 3 "nonstutterers") and their mothers who were excluded from the final study for various reasons, for example, supposed "stutterers" who produced less than 3% within-word disfluencies, one of the primary criteria for being classified as a "stutterer". The average age of the 3 excluded stutterers (2 males and 1 female) was 56 months and the average age of the 3 excluded nonstutterers (2 males and 1 female) was 53 months.

As an indirect index of mothers' educational and/or social economic status, the following were the most commonly self-reported occupations noted: nine mothers of the stutterers (ST) and 9 mothers of nonstutterers (NS) were homemakers, four S mothers and 1 NS mother were school teachers, two S mothers and 2 NS mothers were clerks, one S mother and 3 NS mothers were nurses, 3 S mothers and 0 NS mothers were secretaries, 3 S mothers and 0 NS mothers waitresses and the remaining 19 mothers variously representing other occupations (e.g., accountants, aerobics exercise instructors, sales and service professions). There were no apparent differences between the mothers of stutterers and mothers of nonstutterers in terms of the number of them involved in professional, skilled, semi-skilled, and unskilled professions.

All 56 children and their mothers were from the Central New York area. Subjects who stuttered were referred to the principal investigator (E. Conture) by themselves, area day care, preschool, elementary school or other professional personnel; however, all nonstuttering children were referred to this study by means of the mothers' responses to local newspaper ads seeking "typical 3-7 year old children to participate in a study of mother-child conversations." All 56 mother-child pairs were paid volunteer participants who were naive to the precise purpose and methods of the project.

Characteristics of collected speech sample. Data were collected and analyzed regarding the nonspeech associates of the 28 young stutterers' stutterings ($\underline{N}$ = 280 or 10 randomly selected stutterings per each of the 28 stutterers) and a like number of comparable fluent utterances[1] produced by their 28 sex- and age-matched nonstuttering peers. All 56 children interacted with their mothers during a loosely structured conversation that took approximately 30 min per mother-child pair. Each child was seated across from his or her mother at a small table containing a Fisher Price space station and various toy objects and figures appropriate for use with the space station. Use of such material has been shown to be an effective way to obtain samples of conversational speech from young children (Miller, 1981). Mothers and children were instructed to talk and play as they would at home, using the objects placed on the table and/or talk about any other topics that they wanted to discuss. The entire mother-child conversational interaction was audio-videotaped for approximately 30 min.

For each of the 56 children, the principal investigator (Conture), in collaboration with a graduate research assistant (LaSalle), orthographically transcribed the first 300 intelligible, correctly articulated words produced by the child beginning at the 10th (10:00:00) and usually ending before the 20th (20:00:00) min of recording, that is, during the approximately middle 10 min of the 30-min mother-child conversation. Young stutterers took a mean of 15.3 min (SD

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[1] The ten fluent words of each nonstuttering child were matched to the ten stuttered words of his or her matched stuttering child in terms of grammatical function, word length, initial consonant and sentence position.

= 8.5 min) to produce 300 intelligible words, and their nonstuttering peers took a mean of 11.1 min (SD = 6.1 min), a difference which approached significance (U = 259.0; p = 0.03). This difference in the time to reach 300 intelligible words was most probably due to the fact that 8 of the 28 young stutterers frequently produced phonological processes (i.e., systematic sound changes that affect entire classes of sounds or sound sequences) and thus it took them longer to achieve 300 intelligible words.

As would be expected, given the above talker group classification criteria, there were appreciable between-group differences in disfluencies. The 28 young stutterers produced an average of 9.5 (SD = 5.9) within-word disfluencies (i.e., stutterings) per 100 words and their nonstuttering peers produced an average of 0.7 (SD = 0.5) within-word disfluencies per 100 words, findings nearly identical to those reported by Conture and Kelly (1991) with another sample of 30 young stutterers and 30 age-, sex-matched nonstuttering peers. The average duration of the young stutterers' measured within-word disfluencies was 1203 ms (SD = 370 ms) versus 359 ms (SD = 60 ms) for their nonstuttering peers' comparable fluent words, durations very similar to those reported by Conture and Kelly (1991) for the nonstutterers (M = 342 ms) but somewhat longer than that found by Conture and Kelly for stutterers (M = 913). (It should be here noted that neither Conture & Kelly [1991] nor LaSalle & Conture [1991] found any significant correlation between the duration of stuttering and the number of nonspeech behaviors per stuttering.)

Nonspeech behaviors of the mothers of stutterers versus mothers of nonstuttering peers.

Since Conture and Kelly (1991) have extensively reported on the nonspeech behaviors of young stutterers while conversing with their mothers, and Conture and LaSalle (1991) have developed, as per the dictates of this grant, a commercially-available film depicting the essence of these findings, we will not repeat them in detail in this space. Neither will we extensively review subjects, methods and findings of our study of nonspeech behaviors of young stutterers at or near the onset of stuttering (i.e., Schwartz, Zebrowski & Conture, 1990). Instead we will provide essential findings of these two empirical studies (i.e., Conture & Kelly, 1991; Schwartz, Zebrowski & Conture, 1990) to provide background for our concentration on results pertaining to the mothers' nonspeech behaviors, with and without reference to those simultaneously produced by their children (i.e., findings of Conture and LaSalle, 1991; LaSalle and Conture, 1991).

Nonspeech behavior at or near onset of stuttering. Schwartz, Zebrowski and Conture (1990) assessed the nonspeech behavior of 10 young stutterers and 10 age- and sex-matched nonstuttering peers. These were the same 20 subjects whose speech behavior had been previously assessed by Zebrowski and Conture

(1989). The unique feature of the Schwartz et al study was that the all 10 young stutterers were within 12 months of the reported onset; to our knowledge, the nonspeech behavior of young stutterers at or near the onset of stuttering had never been previously studied. Results indicated that all 10 young stutterers exhibited nonspeech behavior in association with their stuttering, and that chronological age did not significantly correlate with any of the measured nonspeech behavior. Findings are taken to suggest that at or near the onset of stuttering, young stutterers exhibit nonspeech behavior in association with their stuttering, behavior that heretofore were considered only exhibited during more advanced forms of stuttering. Thus, it would seem that clinicians should not wait for the child's stuttering to develop further before they attempt to objectively assess the number and variety of associated behavior. These findings would further suggest that for some children who stutter, stuttering may not be gradual in onset and development and, therefore, may need fairly direct remediation right from the beginning.

Nonspeech behaviors of young stutterers. Conture and Kelly (1991) objectively assessed the nonspeech behaviors of 30 young stutterers and 30 age-, sex-matched nonstuttering peers. In essence, Conture and Kelly found that young stutterers produce significantly more and a greater variety of nonspeech behavior during stuttering (a total of 445 instances of 47 different nonspeech behaviors);

than do their nonstuttering peers during fluency (a total of 190 instances of 28 different nonspeech behaviors). However, there is appreciable overlap in nonspeech behavior between these two talker groups, just as there is in disfluency. The number and variety of nonspeech behavior exhibited by children can be used to discriminate, at a level far greater than chance, between those children who do and those who do not stutter. Three nonspeech behaviors in particular, that is, eyelid blinking, eyeball movement to the left and upper lip raising, were produced significantly more often by young stutterers than young nonstutterers. Also, two other nonspeech behaviors, that is, lip pressing and lower jaw dropping, were nearly significantly more likely to be produced by young stutterers than nonstutterers.

Findings were taken to suggest that number and certain types of nonspeech can be successfully used to discriminate between children at no versus varying degrees of some risk for chronic stuttering. Results were also interpreted to suggest that certain nonspeech behaviors, rather than merely being overflow of muscle tension as is commonly thought, may actually be functional in nature, that is, used by the young stutterer to maintain the speaking turn by averting eye contact and/or relinquishing the speaking turn by blinking his eyes, directly or indirectly suggesting to listener that it is now their turn to talk. It was concluded that the nonspeech behaviors associated with childhood stuttering appear to be a rich source of information about stuttering from its onset onward and seemingly deserve continued empirical investigation. Whatever the case, the above two studies (Conture & Kelly, 1991; Schwartz, Zebrowski & Conture, 1990) provided the background for the next two studies which attempted to assess the nonspeech behavior of the mothers of young stutterers.

Eye contact between young stutterers and their mothers. LaSalle and Conture (1991) found, with a randomly-selected subset ($\underline{N}$ = 20) of the 56 children currently under discussion, the following: (1) eye contact was significantly more frequent for young stutterers and their mothers during stuttering than for normally fluent peers and their mothers during fluency; (2) gazing elsewhere than towards each others' faces was significantly more likely during the fluency of young nonstutterers and their mothers than during the stutterings of young stutterers and their mothers; and (3) mothers of young stutterers "set the occasion" for eye contact with their child in that they gazed at their stuttering sons more frequently ($\underline{M}$ = 49%) than did mothers of nonstutterers ($\underline{M}$ = 26%). LaSalle and Conture interpreted their findings to suggest that mothers of young stutterers may look to monitor her child's behavior as he stutters and/or look to inform her stuttering child that she is attending to him. That is, the mother of the child who stutters appears to be "watching" her son to assess whether he is having difficulties communicating and if she detects such difficulties, seemingly nonverbally communicating to the child her concern and/or willingness "to help". These findings as well as interpretations are quite contrary to the common notion that parents of children who stutter are "looking away," that is, frequently breaking eye contact and that this "lack of eye contact" is contributing to the child's problem. Instead, these findings suggest that the parents of children who stutter may need help to minimize their displays of overt monitoring and/or concern. That is, parents of young stutterers may need to learn to watch their child's face approximately the same amount (about 25% of time) as parents of nonstuttering children do during comparable fluent words. In other words, these parents may need help in adopting a more naturalistic amount of eye contact rather than being encouraged to make more eye contact with their child, particularly when he or she is stuttering.

Nonspeech behaviors of mothers of young stutterers. Conture and LaSalle (1991) found that the 28 mothers of stutterers produced a total of 391 nonspeech behaviors during their sons' 280 stutterings versus only 140 nonspeech behaviors exhibited by the mothers of young nonstutterers during their child's fluent words. The 2.8 (i.e., 391/140) ratio of between the total nonspeech behaviors exhibited by mothers of stutterers versus that exhibit of mothers of nonstutterers is very similar to the 2.3 (445/190) ratio reported by Conture and Kelly (1991) between the nonspeech behaviors of young stutterers to those of their nonstuttering peers.

Conture and LaSalle (1991) found that the 28 mothers of stutterers ($N = 28$) produced significantly (Mann-Whitney $U = 740$; $p < 0.01$) more nonspeech behaviors per their child's stuttered word ($M = 1.4$; $SD = 0.7$) than did the 28 mothers of nonstutterers produced per their child's fluent word ($M = 0.5$; $SD = 28$), findings almost identical to those reported by Conture and Kelly (1991) with another sample of 30 young stutterers and 30 of their nonstuttering peers. Neutral (i.e., no discernible facial behavior, either changing or unchanging, of any kind) facial gestures were significantly ($U = 135$; $p < 0.01$) more frequently exhibited by mothers of nonstuttering children during their child's fluency ($M = 5.5$ per 10 fluent words; $SD = 1.7$) than mothers of stuttering children during their child's stutterings ($M = 3.7$ per 10 stutterings; $SD = 1.8$), findings again very consistent with those reported by Conture and Kelly (1991) concerning young stutterers and their nonstuttering peers. Most interestingly, eyeblinks were significantly ($U = 562$; $p < 0.01$) more frequently exhibited as the first nonspeech behavior by mothers of stutterers during their child's stuttering ($M = 2.1$; $SD = 1.8$) than by mothers of nonstutterers during their child's fluency ($M = 0.8$; $SD = 1.0$), a finding quite consistent with that reported by Conture and Kelly (1991) for young stutterers and their nonstuttering peers. When compared to mothers of nonstutterers during fluency, mothers of young stutterers during stuttering produced significantly more (i.e., Mann-Whitney U $p < 0.01$): lips part (opening), lips towards (closing), lip press, head up, lip corner pull (involved in grimacing, smiling, etc.) and eyes up. It should be noted, as with the Conture and Kelly (1991) study, Conture and LaSalle (1991) only measured the mothers and their child's nonspeech behaviors, thus such behaviors as lips part, towards or press refer to behaviors which occurred in the absence of any visually and/or audibly apparent attempts to produce speech.

One of the more interesting findings of Conture and LaSalle's study was the fact that 9 or 60% of the mothers of stutterers 15 most commonly occurring nonspeech behaviors were identical to the 21 most commonly occurring nonspeech behaviors of young nonstutterers reported by Conture and Kelly (1991). Blinking, in particularly, was the first most common nonspeech behavior for the 28 mothers while it was the 3rd most common for Conture and Kelly's 30 young stutterers; similarly, combinations of nonspeech behavior (e.g., blinking + lip press) were the 2nd most common behavior by mothers of young stutterers and the 5th most common for Conture and Kelly's 30 young stutterers. Thus, while there is not exact similarity between the types of nonspeech behaviors exhibited by mothers of stutterers and their stuttering sons, there is considerable agreement in terms of those nonspeech behaviors the two produce during the same epoch in time, that is, instance of stuttering.

One interesting difference between Conture and Kelly's findings with young stutterers and that of the Conture and LaSalle (1991) study with mothers of young stutterers was the mothers tendency to move their lips apart and/or together while their child was stuttering. This difference between mother and child is at least a partial artefact since lips parting and moving together could not be readily scored during the child's stuttering because they were probably more likely to have been speech-related gestures; however, this was not the case for the mothers whose nonspeech behaviors were measured while they silently listening and/or watching their child stutter. It is our conjecture that the mothers' lip movement - both the opening and closing of which is significantly more than that of mothers of nonstutterers during fluency - is a conscious and/or unconscious behavior the mother exhibits in attempts to help her child "get through the word." In other words, she is trying to help the child articulate and/or fluently produce the sound, syllable or word he is exhibiting difficulty completing. It is as if she believes that her "silent mouthing" of the child's speech gestures may help the child successfully complete his disfluent utterance. Or, it could be that this behavior is something the mother does to "silent formulate" the child's sound, syllable or word to better help her understand what the child is trying to say, to make the child's production more intelligible to her by mimicking the child's gesture. If the latter is the case, that the mother is "silently formulating" her child's "flawed" speech gestures, then one would expect to see similar behavior on the part of mothers during their child's misarticulations and/or disturbances in expressive language. That is, mothers' silent formulation for purposes of perception and/or silent mouthing for purposes of assistance may be a "universal" device employed whenever the listener "wants to help with" and/or is having difficulty understanding various errors in the speaker's oral communication, for example, disfluencies, misarticulations, or disruptions in expressive language.

Implications. Findings resulting from studies supported by this project (e.g., Conture & Kelly, 1991; Conture & LaSalle, 1991; LaSalle & Conture, 1991; Schwartz, Zebrowski & Conture, 1990) suggest the following: (1) that children who stutter, at or near the onset of their problem, are already exhibiting nonspeech behaviors in association with their stutterings, behaviors which heretofore were thought to be only exhibited by more advanced or older stutterers; (2) the number and nature of certain types of nonspeech behaviors exhibited by stutterers during stuttering are clearly different than those produced by their nonstuttering peers during fluency, a difference in frequency and type which may make a difference in terms of these behaviors being detected and hence adversely reacted to by their listeners; (3) young stutterers and their mothers, contrary to common clinical advice, appear to be making more not less eye contact than that exhibited by their young nonstuttering peers and their mothers, a finding seemingly resulting from the mothers of young stutterers demonstrated tendency to "watch" their child's face in attempts to monitor their child's speaking difficulties and/or inform their child that they are concerned and attending to them during their difficulties; and (4) the number and nature of mothers' of stutterers and mothers' of nonstutterers, while different from one another, seems highly similar to those exhibited by their child and may be involved in some as yet poorly understood, highly complex, bidirectional (non)speech communication between mother and child. Findings are taken to provide strong support for Johnson and Associates (1959, p. 261) speculation that parents "react, nonverbally as a rule but verbally in some cases to [the child's stuttering] and to the child." Whether these "reactions" exacerbate and/or maintain the child's stuttering is, of course, still unknown. However, our findings clearly indicate that young stutterers exhibit these behaviors as do their mothers which strongly suggests that the frequency, nature and potential bidirectional influences of these behaviors need to be carefully and thoroughly considered by any therapy and/or theory attempting to account for the onset and development of stuttering in children.

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Young Stutterers' Nonspeech Behaviors During Stuttering

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The purpose of this study was to assess the nonspeech behaviors associated with young stutterers' stuttering and normally fluent children's comparable fluent utterances. Subjects were 28 boys and 2 girls who stutter (mean age = 54 months) and 28 boys and 2 girls who do not stutter (mean age = 54 months). Each child and his or her mother were audio-video recorded during a loosely structured, 30-min conversation. Sixty-six different nonspeech behaviors associated with 10 randomly selected stutterings per stutterer and 10 comparable fluent utterances per normally fluent child were assessed by means of frame-by-frame analysis of the audio-video recordings. Results indicate that (a) young stutterers produce significantly more nonspeech behaviors during stuttered words than do normally fluent children during comparable fluent words, (b) young stutterers produce significantly more head turns left, blinks, and upper lip raising during stuttered words than do normally fluent children during comparable fluent words, and (c) talker group membership could be significantly determined on the basis of certain types of nonspeech behaviors despite considerable overlap in frequency and type of nonspeech behavior between the two talker groups. Findings suggest that children can be classified as stutterers on the basis of their nonspeech behaviors and that these behaviors may reflect a variety of cognitive, emotional, linguistic, and physical events associated with childhood stuttering.

KEY WORDS: nonspeech behavior, stuttering, young stutterers, nonverbal behavior, associated behavior

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The nonspeech behaviors associated with stuttering—variously termed *accessory, associated,* or *secondary behaviors,* as well as *physical concomitants* (Bloodstein, 1987; Van Riper, 1982; Wingate, 1964)—have long been of interest to clinicians and researchers alike. For example, two widely used tests of stuttering severity—the Iowa Scale for Rating Severity of Stuttering (Johnson, Darley, & Spriestersbach, 1963) and the Stuttering Severity Instrument (Riley, 1980)—rate these associated behaviors along with measures such as duration and frequency of stuttering to obtain an overall measure of stuttering severity. It is also frequently suggested that clinicians directly modify behaviors associated with stuttering, for example, stutterers' eye contact with their listeners (Atkins, 1988). However, as some have noted, "The concomitant features of stuttering are many and extremely varied" (Bloodstein, 1987, p. 17), and "the variety of these accessory or secondary behaviors is almost incredible" (Van Riper, 1982, pp. 122–123). Thus, despite considerable interest in the nonspeech behaviors associated with stuttering and recognition of their importance to thorough descriptions of stuttering (Bloodstein, 1987; Egolf & Chester, 1973; Van Riper, 1982; Wingate, 1964), there have been relatively few attempts to objectify the number and nature of these behaviors (Barr, 1940; Krause, 1982; Prins & Lohr, 1972; Schwartz & Conture, 1988; Schwartz, Zebrowski, & Conture, 1990). Perhaps this relative lack of objectification is due, at least in part, to the apparent, seemingly idiosyncratic, variation of nonspeech behavior within and between stutterers.

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We do know, however, that young children who stutter (mean age = 49 months), at or near the onset of their problem, produce, on the average, 1.1 nonspeech behaviors per stuttering (Schwartz, Zebrowski, & Conture, 1990). Likewise, older children who stutter (mean age = 71 months) have been reported to produce an average of 1.73 associated behaviors per stuttering (Schwartz & Conture, 1988). Adults who stutter reportedly produce an average of 2.33 associated behaviors per stuttering (Prins & Lohr, 1972). Krause (1982) reported that adult stutterers produce an average of 16 nonspeech behaviors during a 20-s speech sample (Krause did not report the amount of stuttering per sample). What we do not know, despite these apparently age-related changes in stutterers' nonspeech behavior, is whether the number and nature of young stutterers' associated behaviors are significantly different from those produced by their normally fluent peers during comparable fluent utterances.

For example, it is presently unknown whether the distributions of nonspeech behaviors of young stutterers and of their normally fluent peers overlap to the same degree as do the distributions of their speech disfluencies (Johnson & Associates, 1959, pp. 200–214). Perhaps the two talker groups differ more in the *number* than in the *nature* of nonspeech behaviors. Thus, observers may notice and react more to differences in number than they do to the nature of young stutterers' nonspeech behavior. Likewise, it is also unknown whether stutterers produce more nonspeech behaviors during stutterings than their normally fluent peers do during fluency because stuttered words are longer in duration than comparable fluent words (Zebrowski & Conture, 1989). Thus, young stutterers may have more time per word to produce nonspeech behaviors than do their normally fluent peers, which suggests that differences in nonspeech behaviors between stuttered and fluent words would be more related to the duration than the quality (i.e., stuttered or fluent) of the word. Conversely, if there are differences in the *nature* of nonspeech behaviors between stuttered and fluent words, one might speculate that nonspeech behaviors during stuttering are related to different underlying processes or serve a different function than those during comparable fluent utterances. For example, adult stutterers produce significantly fewer head movements during speech, stuttering notwithstanding, than do normally fluent adult speakers (Krause, 1982). Whatever the case, none of these possibilities has received objective assessment.

One difficulty with objectively assessing nonspeech behaviors associated with stuttering, however, is that different researchers have used different methods to do so (Krause, 1982; Prins & Lohr, 1972; Schwartz & Conture, 1988; Schwartz, Zebrowski, & Conture, 1990). Although there is no simple solution to this complex methodological issue, matters might improve if all researchers employed one reasonably objective, comprehensive, and intention-free description of nonspeech behavior. One such procedure is that of Ekman and associates (Ekman, 1982; Ekman & Friesen, 1975, 1978a, 1978b), who developed a "comprehensive descriptive system of facial action by analyzing the anatomical muscular basis of facial movement" (Wiggers, 1982). Although other coding systems are available (e.g., the Maximally Discriminative Facial Movement Coding System [MAX], Izard, 1979), Ekman and Friesen's (1978a, 1978b) Facial Action Coding System (FACS) seems to be one of the most objective and comprehensive systems presently available to specify facial behaviors that minimally overlap with one another (i.e., are nonredundant). Furthermore, FACS has been shown to be applicable to the description of young childrens' facial behavior (Unzner & Schneider, 1990) and their recognition and understanding of facial expressions (e.g., Bullock & Russell, 1985; Camras, 1980; Wiggers & van Lieshout, 1985). FACS distinguishes among 44 facial "action units" (e.g., eye blink, jaw drop, lip pucker), an action unit being defined as the minimal unit of facial behavior that is anatomically separate and visually distinguishable. FACS also permits the scoring of 14 more grossly defined head and eye positions (e.g., head turn left, right; head back, forward). Of particular importance is the fact that FACS permits an inference- or intention-free description of a wide variety of facial activities. Such intention-free descriptions of nonspeech behaviors (e.g., head turns) are to be distinguished from the inference-laden descriptions (e.g., "avoiders," "starters," and "fillers") typically used to describe stutterers' nonspeech behavior. Thus, using FACS not only provides basic, inference-free information about stutterers' associated nonspeech behaviors but also permits researchers to readily compare these behaviors to those exhibited by normally fluent peers.

Given our lack of understanding of differences in nonspeech behavior between young stutterers and their normally fluent peers and the possible relation these behaviors have to stuttering, it behooves us to learn more about the number as well as the nature of nonspeech behaviors during the speech of young stutterers and their normally fluent peers. To obtain this knowledge, we need to observe systematically and objectively young stutterers' nonspeech behaviors during stuttering and those of their normally fluent peers during comparable fluent utterances, using intention-free descriptions. These observations should help us more adequately assess clinical as well as research speculation that young stutterers' nonspeech behaviors differ in degree or kind from those behaviors typically exhibited by their normally fluent peers during comparable fluent tokens. Thus, it was the purpose of this study to objectively assess the nonspeech behaviors associated with young stutterers' stutterings and to compare these behaviors to those produced by their normally fluent peers during comparable fluent utterances.

Method

Subjects

Subjects were 60 children: 30 who stuttered (28 males and 2 females) and 30 who were normally fluent (28 males and 2 females) who were matched in age (+/− 4 months) and sex. The 30 young stutterers had a mean age of 54 months (*SD* = 12.7 months), and the normally fluent children had a mean age of 54 months (*SD* = 13.2 months). Each of the 60 children engaged in spontaneous conversations with his or her mother during a loosely structured, approximately 30-min interaction (to be described below). All 60 mother-child pairs were paid volunteer participants who were naive to the precise purpose and methods of the study.

All 60 children were from the Central New York area. Subjects who stuttered were referred to author Conture by their parents, area day care, preschool, and elementary school personnel, or speech-language pathologists or other area professionals and were recorded before any prescribed therapeutic regimen was begun. Subjects who were normally fluent were selected, whenever possible, from the same area day care, preschool, and elementary school settings; however, 10 of the normally fluent children participated in this study as a result of their mothers' responses to a local newspaper ad seeking "typical 3–7 year old children and their mothers to participate in a study of mother/child conversations." A pilot study had shown no statistically significant differences between normally fluent children recruited through the newspaper and those recruited through classroom referral in terms of the nonspeech behaviors of interest—for example, number of facial expressions per fluent utterances. Thus, it was considered appropriate, for the purposes of this study, to pool data for those normally fluent children recruited by contact with classroom personnel (N = 20) and those recruited by newspaper ads (N = 10).

Twelve other children (7 young stutterers, 6 males and 1 female; 5 normally fluent children, 1 male and 4 females) were excluded from this study for one of the following reasons: (a) concomitant problems (e.g., numerous phonological errors rendering most of the child's speech unintelligible),[1] (b) chronological age outside the desired range of 3–7 years, (c) production of an insufficient sample of conversational speech, and (d) failure to meet criteria for group membership in spite of initial referral as a stutterer (to be explained below). The average age of the 7 excluded stutterers was 65 months, and the average age of the 5 excluded normally fluent children was 44 months.

Criteria for Group Membership

A child was considered a stutterer, for the purposes of this study, if both of the following criteria were met: (1) he or she produced 3 or more stutterings (within-word disfluencies) per 100 words of conversational speech, and (2) people who knew the child had expressed concern regarding the child's speech fluency. A child was considered normally fluent, for the purposes of this study, if he or she produced 2 or fewer within-word speech disfluencies per 100 words of conversational speech and people who knew the child expressed or implied no concerns. Although Conture (1990a) points out that there is no known frequency of within-word disfluencies that can be used to absolutely differentiate between children who do and do not stutter (i.e., there will always be the possibility for false positives and misses; Conture, 1990b, Figure 1-1), the findings of Johnson and Associates (1959) indicate that less than 10% of children classified as normally fluent (N = 89) exhibited 3 or more within-word disfluencies per 100 words, whereas nearly 60% of children classified as stutterers (N = 89) did so. Therefore, using 3 or more within-word disfluencies as one of two criteria for group membership appears to be a reasonable, quantifiable, and replicable means for classifying children as stutterers.

Data Collection

All 60 children interacted with their mothers during a loosely structured conversation that took approximately 30 min per mother-child pair. Each child was seated across from his or her mother at a small table containing a play house and various appropriately sized objects, people, and furniture for use with the house. Use of such material has been shown to be an effective way to obtain samples of conversational speech from young children (Miller, 1981). Mothers and children were instructed to talk and play as they would at home, using the materials on the table. The entire mother-child interaction was audio-videotaped for approximately 30 min, long enough for the experimenters to obtain a sample of 300 words or more from each child, in the vast majority of cases.

Instrumentation. Two high-quality Panasonic color video cameras (Models WV-3500 and WV-3250) were used, one directed toward the child and the other toward the mother, positioned to obtain a clear video image of the mother's[2] and the child's head, neck, upper torso, hands, and arms. The output of each camera was channeled to a Panasonic video switcher (Model WJ-3500), where the two signals were multiplexed, or combined. The resulting split-screen composite, with the child occupying the left half of the screen and the mother the right, was displayed on a Sony color television monitor (Model CVM-1720). The output of an Evertz edit or time code generator/reader (Model 3600D) was fed through the switcher, and the Evertz's time code (minutes:seconds: videoframes) was time-locked to the videotape recording of the mother-child interaction and visually displayed on the upper central portion of the television monitor's split-screen composite image. Provision of a visible time code has been shown to assist significantly in locating selected portions of data during reiterative viewing and subsequent analysis of audio-videotaped behavior (see Conture, 1987; Conture, Schwartz, & Brewer, 1985; Mahshie & Conture, 1983). The video composite image, together with the time-locked time code display, was recorded on a high-quality ¾ in. Sony videocassette recorder (VCR; Model BVU-200A), along with the associated acoustic signals from mother and child (see Kelly, 1989, Figure II-1, for schematic of the instrumentation and its arrangement in the room used for audio-video record-

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[1] Louko, Edwards, and Conture (1990) describe the number and type of phonological processes exhibited by the 30 stuttering and 30 normally fluent children used in the present study. In the present study, only perceptually intelligible stuttered and fluent words were analyzed in terms of associated nonspeech behaviors.

[2] Mothers' audio and video signals were recorded together with their children's because the authors and their colleagues have found (e.g., Kelly, 1989; Louko, Edwards, & Conture, in press; Schwartz & Conture, 1988; Wolk, 1990) that to do so gives valuable perspective on the child's fluent and disfluent utterances. This technique has also previously been found to enhance measurement as well as interpretation of speech and related nonspeech behaviors because both the child's and mother's face, neck, upper torso, hands, and arms and associated audio signals are simultaneously videotaped.

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ing). The VCR was controlled at the time of recording by means of a video editor (Sony, BVE 200A), which also permitted subsequent viewing of recorded data (to be explained below) from stop motion through real time.

The child's audio signal was obtained using either a Sony (Model ECM-50) or Samson (Model CR-2X) lapel microphone placed on the child's clothing approximately 6 in. from his or her mouth. Mothers were fitted with a Unex headset microphone (Model HS-1 A101) placed 1–2 in. from the mouth. Both mother's and child's audio signals were simultaneously recorded, combined by the video switcher, and stored on separate audio channels of the VCR along with the video signals.

Neutral-toned cloth backdrops were placed behind both the child and the mother to reduce visual distractions and provide a consistent background for maximum clarity and contrast of the recorded images. Two Lowel 1000-watt studio lights were positioned facing the taping areas from opposite sides to provide additional illumination for a consistently clear video image.

Assessment of Speech and Nonspeech Behavior

General considerations. For each of the 60 children, a 300-word sample was obtained during the middle 10 min of the 30-min mother-child interaction. This sampling procedure was based on Zebrowski's (1987) findings that it takes 2- to 7-year-old stutterers and their mothers about 5–10 min to adjust to the conversational setting—for example, wearing a tie-tack or lapel microphone and being videotaped—and that after 20 min of such conversation the children start to fatigue and grow restless, ask to leave, and so forth. Mothers rather than fathers were selected as conversational interactants with their child because of the experimental need to maintain similar parent-child interactions across all 60 subjects. We also selected mothers because the diagnostic records (Zebrowski & Conture, 1989) of 51 children who stutter, randomly selected from Syracuse University's Gebbie Speech and Hearing Clinic files, indicated that mothers were sole informant for 52% (26/51) of the diagnostics and were joint informants with the fathers for another 41% (21/51) of the diagnostics. The fact that mothers were sole or joint informants in 93% of all 51 diagnostics suggested to us that mothers are very frequently involved with the initial diagnosis of stuttering and early onset and development of the problem.

Length of conversational samples. For each of the 60 children, author Conture, in collaboration with author Kelly, orthographically transcribed the first 300 intelligible words produced by the child between the 10th (10:00:00) and 20th (20:00:00) min of recording, that is, during the middle 10 min. Zebrowski (1987) previously found that 20 children (10 normally fluent and 10 stutterers) similar in age to those in the present study took, on the average, about 8 min 10 s (range = 4 min 27 s to 14 min 27 s) to produce 300 intelligible words. It was possible in the present study to obtain 300 intelligible words within the middle 10 min of recording for 45 of the 60 subjects. However, 15 children (10 stutterers and 5 normally fluent) took from 10 min 7 s to 15 min 43 s to produce 300 intelligible words. All of these children were under 4 years and 6 months of age, except a normally fluent boy who was 6 years and 11 months old.

Judgments of disfluent and fluent words. After transcribing each child's 300 words, the authors independently judged each instance of within-word disfluency as well as each disfluency's onset and offset (in minutes:seconds: videoframes). All words that did not contain an overt within- or between-word disfluency were considered, for the purposes of this study, to be perceptibly fluent. Judgments of fluency or disfluency were made on the basis of auditory information; author Conture's judgments served as the data for the study, and author Kelly's judgments were used to determine interjudge measurement reliability (to be discussed below). From each of the young stutterers' 300-word samples, a randomly selected sample of 10 within-word disfluencies was chosen for analysis. A comparable sample of 10 fluent words was chosen for each normally fluent subject. The 10 fluent words were selected from that normally fluent child who most closely matched the stuttering child in age (+/− 4 months) and sex. The 10 randomly selected words containing within-word disfluencies from each young stutterer were matched in terms of orthographic length, position in the sentence, initial consonant, and grammatical function to 10 fluent words produced by the age- and sex-matched normally fluent child.

Judgment of nonspeech behavior. Using FACS, 44 different facial actions, 14 more grossly defined head and eye movements, and 8 author-defined arm, hand, and torso movements were assessed during the entire duration of each of the 300 stuttered words produced by the 30 young stutterers and during each of the comparable 300 fluent words produced by the normally fluent children. FACS scoring (Ekman & Friesen, 1978a, 1978b) can be done either independently or jointly (arbitrated). In the present study, the authors scored each of the 600 disfluent and fluent words independently, with Conture's scores serving as the data for this study and Kelly's scores used to assess interjudge measurement reliability (to be discussed below).

For each child's ($N = 60$) 10 fluent or stuttered utterances, the two authors assessed all possible "action units." Action units are those specific muscular movements "responsible for momentary changes in facial appearance" (Ekman & Friesen, 1978a, p. 1–1) that "are anatomically separate and visually distinguishable" (Wiggers, 1982, p. 102) and that can be described without reference to the subject's intention. These action units (AUs) were assessed in the following sequence: (a) AUs associated with the upper face (e.g., upper eyelid raiser), (b) AUs associated with up/down actions of the lower face (e.g., upper lip raiser), (c) AUs associated with lower face horizontal action (e.g., lip stretcher), (d) AUs associated with lower face oblique action (e.g., sharp lip puller), (e) AUs associated with lower face orbital action (e.g., lip pucker), (f) miscellaneous AUs (e.g., tongue show), (g) head and eyeball positions (e.g., head right), and (h) several experimenter-defined actions associated with the upper body, hands, and arms (e.g., torso right). Appendix A provides a complete listing of the 44 FACS action units, 14 more grossly defined actions units of head and eye position (adapted from Ekman & Friesen, 1978a, 1978b), and 8 experimenter-defined actions pertaining to upper torso, hand, and arm movements.

Excluded nonverbal behavior. Because, to these authors' knowledge, this is the first reported study employing FACS to assess the nonspeech behavior of *children* who stutter, it was believed that a conservative approach was necessary. Thus, a variety of behaviors (e.g., talking, playing with toys) were excluded from consideration to maximize the chances that only those behaviors associated with stuttering would be collected and analyzed and not extraneous or irrelevant behavior associated with other events. Figure 1(A) shows the first such excluded behavior class, *object adaptor* (or *self-manipulatory;* Beattie, 1983; Duncan, 1972), that is, movement or positioning of objects or materials such as toys, microphone, or chair. Figure 1(B) shows the second type of excluded behavior, *self-adaptor* (or *self-stimulative* or *body-focused;* Beattie, 1983; Duncan, 1972), that is, any movement that brings the hand or body part in contact with one's own body (e.g., real or "pretend" grooming of hair with hand, rubbing nose or chin with forearm, scratching head with hand). The third type of excluded facial behavior was *speech-related* (Figure 1C), that is, any facial action units judged to be wholly or partially related to production of the associated fluent or stuttered sounds (e.g., lip pressing for /p/ or lip parting for /i/). Neither the number nor the type of these three excluded behaviors (i.e., speech-related, self-adaptors, or object-adaptors) was tabulated because the presence, absence, and function of these behaviors were unrelated to the purposes of this study. Instead, any of these behaviors that occurred during a measured fluent or stuttered token was excluded from further analysis. Furthermore, if one of the behaviors shown in Figure 1 made the scoring of a co-occurring action unit ambiguous (e.g., a speech-related lip rounding for /u/ co-occurring with the lip-tightening action unit), the co-occurring action unit was not scored and was excluded from further analysis.

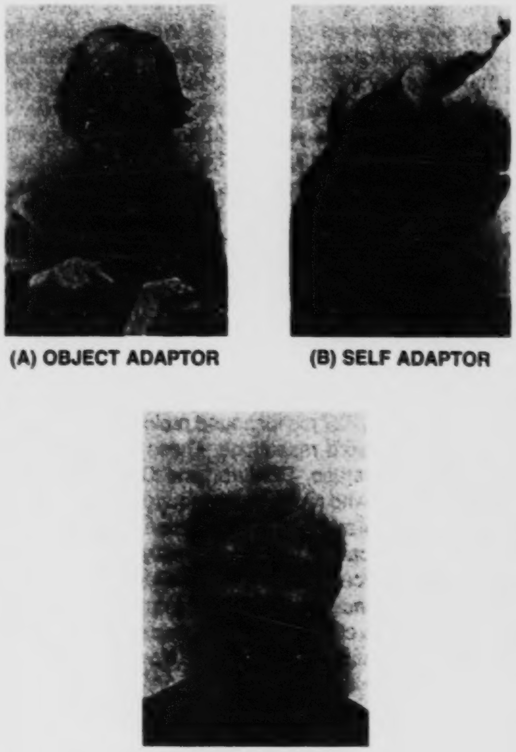
(A) OBJECT ADAPTOR
(B) SELF ADAPTOR
(C) SPEECH RELATED

FIGURE 1. Examples of typical (A) object adaptor and (B) self-adaptor nonspeech behavior (Duncan, 1972) as well as (C) speech-related nonspeech behavior, that is, lip-spreading for /i/. These three types of behavior were not considered as nonspeech behavior associated with stuttered or fluent words (see text). Examples shown in this and all other figures were exhibited—upon the request of author Conture—by normally fluent children between 4 and 5 years of age. These examples were used, rather than the original color videotape data, to enhance visual clarity and reproducibility of figures for purposes of journal publication, that is, to minimize the blurring and degradation inherent in the making of second-generation black-and-white photo copies of original color videotape images.

Neutral and unobservable behaviors. FACS permits the tabulation of a "neutral" AU, four "not visible" (i.e., "unobservable")—brows not visible, eyes not visible, lower face not visible, and entire head or face out of view—and one unscorable score (unscorable refers to the presence of some movement during the event being scored that did not reach the minimum requirements for any action unit like "upper lip raiser" or action descriptor like "head turn right"). Figure 2 shows examples of "neutral" AUs, that is, where the face has "no detectable action of any kind" (Ekman & Friesen, 1978a, p. 10–3). Figure 3 shows various partially or completely "not visible" behaviors, that is, where one "cannot score a facial area because it is not visible" (Ekman & Friesen, 1978a, p. 10–2).

Data will be reported with and without "not visible" behaviors because some of these behaviors do not preclude the simultaneous recording of certain other AUs (e.g., "eyebrows not visible" does not preclude analysis of lower face behav-

(A) NEUTRAL
(B) NEUTRAL

FIGURE 2. Examples of neutral (Ekman & Friesen, 1978a, p. 10–3) nonspeech behaviors exhibited by two different children.

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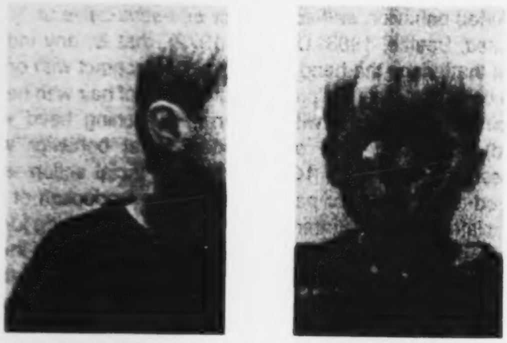
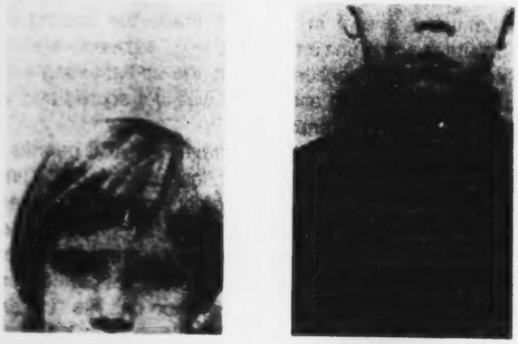


(A) NOT VISIBLE ENTIRE FACE

(B) NOT VISIBLE ENTIRE FACE



(C) NOT VISIBLE LOWER FACE

(D) NOT VISIBLE UPPER FACE

FIGURE 3. Examples of four different nonvisible nonspeech behaviors.

ior). In addition, many not visible behaviors seemingly resulted from inappropriate or excessive head/torso movement, and it was considered important to know whether the young stutterers and their normally fluent peers differed in terms of such behavior. Furthermore, it was considered relevant to report differences in neutral AUs between the two talker groups because these neutral AUs appear comparable to the often-mentioned "frozen face" or "blank expression" thought to be exhibited by stutterers and their listeners during instances of stuttering.

Intrajudge and interjudge measurement reliability. Author Conture's interjudge and intrajudge reliability for measuring speech and nonspeech behavior, similar to that mentioned above, has been documented elsewhere (Brayton & Conture, 1978; Conture & Brayton, 1975; Conture, McCall, & Brewer, 1977; Schwartz & Conture, 1988). For the present study, intrajudge (Conture) and interjudge (Conture vs. Kelly) measurement agreement indexes (i.e., agreements divided by agreements plus disagreements) for 60 randomly selected samples (one stuttered or fluent word randomly selected from each stuttering or normally fluent child, respectively) indicated intrajudge/interjudge agreements of 94%/90% for number of stutterings, 88%/85% for specific type of stuttering (e.g., sound/syllable repetition vs. sound prolongation), 87%/84% for number of facial action units and related nonspeech behavior, and 83%/80% for specific facial action units (e.g., blinks vs. upper lip raise) and related nonspeech behavior. These values for intrajudge/interjudge measurement reliability for facial action units and related nonspeech behaviors, using FACS scoring criteria, are comparable to those reported in both FACS documentation (Ekman & Friesen, 1978b) and published studies in which FACS was employed (Unzner & Schneider, 1990; Wiggers, 1982). Mean intrajudge/interjudge measurement error for duration of stuttered or fluent word was plus or minus 5.5 videoframes or 183.2 ms (range = 0–10 videoframes or 0–333 ms) per utterance.

Results

Fluent and Disfluent Speech Behavior

The young stutterers produced an average of 8.9 (SD = 4.4) within-word disfluencies (i.e., stutterings) per 100 words, and their normally fluent peers produced an average of 0.7 (SD = 0.6) within-word disfluencies per 100 words. The average duration of the young stutterers' measured within-word disfluencies was 913 ms (SD = 184 ms) versus 342 ms (SD = 64 ms) for their normally fluent peers' comparable fluent tokens.

Of the 300 analyzed stutterings produced by the 30 young stutterers, 174 were sound/syllable repetitions, 118 were sound prolongations, and 8 were monosyllabic whole-word repetitions. On the average, each young stutterer produced 5.8 sound/syllable repetitions, 3.9 sound prolongations, and 0.3 monosyllabic whole-word repetitions per 10 instances of stuttering. The mean durations were 1015 ms for the sound/syllable repetitions, 727 ms for sound prolongations, and 870 ms for the whole-word repetitions. These findings are consistent those of Caruso, Conture, and Colton (1988) and Zebrowski (1991), who reported that young stutterers' sound/syllable repetitions are longer in duration than their sound prolongations. Because the 30 normally fluent speakers infrequently produced within-word disfluencies (N = 23 within-word disfluencies in the total sample of 9,000 words produced by these children), and because these behaviors were not further analyzed, the specific types and duration of the normally fluent youngsters' within-word disfluencies were not tabulated.

Neutral and Nonviewable Nonspeech Behaviors

Neutral facial gestures[3] were significantly (Mann-Whitney U = 798; $p < 0.01$) more frequent during normally fluent youngsters' fluent utterances (M = 0.53; SD = 1.97) than during young stutterers' comparable stuttered utterances (M = 0.23;

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[3] It is unclear how these neutral facial gestures relate to the often-mentioned "frozen" facial gesture that stutterers supposedly produce; however, we suspect that these "frozen" facial gestures contain scorable facial action units that remain unchanging for some appreciable period of time. In contrast, the "neutral" facial gestures discussed here contain no discernible facial action units, changing or nonchanging, during the time period of interest.

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SD = 0.14). Conversely, nonviewable nonspeech behaviors were significantly (Mann-Whitney $U = 247$; $p < 0.01$) more frequent during young stutterers' stutterings ($M = 0.133$; $SD = 0.23$) than during normally fluent youngsters' comparable fluent utterances ($M = 0.01$; $SD = 0.03$). In essence, normally fluent children during fluency exhibited more "neutral" (i.e., nondetectable) facial gestures than did young stutterers during stuttering; conversely, young stutterers during stuttering exhibited more unobservable or nonviewable behavior than did normally fluent children during fluency.

Duration of Utterance and Number of Associated Nonspeech Behaviors

There was no significant relation between the length of the fluent word and the number of nonspeech behaviors produced by the normally fluent children ($r = 0.24$; $p = 0.20$) or between the length of the stuttered word and the number of nonspeech behaviors produced by young stutterers ($r = 0.25$; $p = 0.18$). There was also no significant relation between the length of the normally fluent youngsters' fluent words and the number of their neutral ($r = -0.10$; $p = 0.59$) or nonviewable behaviors ($r = -0.08$; $p = 0.67$). Likewise, for the children who stutter there was no significant relation between the length of their stuttered words and the number of their associated neutral ($r = -0.12$; $p = 0.53$) or nonviewable behaviors ($r = -0.09$; $p = 0.64$).

Number and Nature of Nonspeech Behaviors

The young stutterers produced a total of 445 instances of 47 different nonspeech behaviors during their 300 stuttered words. Their normally fluent peers produced a total of 190 instances of 28 different nonspeech behaviors during their 300 comparable normally fluent words. Nonspeech behaviors were significantly (Mann-Whitney $U = 56$; $p < 0.01$) more frequent during young stutterers' stutterings ($M = 1.48$; $SD = 0.46$) than during normally fluent youngsters' comparable fluent words ($M = 0.63$; $SD = 0.34$). Thus, children who stutter produce more nonspeech behaviors per stuttering than do their normally fluent peers during comparable fluent words. This finding does not reflect, however, whether the two talker groups significantly differ when identical types of nonspeech behaviors (e.g., head turn right) are compared.

Differences Between Young Stutterers' and Their Normally Fluent Peers' Nonspeech Behavior

Table 1 shows the nonspeech behaviors, expressed as a percent of the total number of nonspeech behaviors exhibited by each talker group. These percentages, taken together, constitute approximately 80% of each talker group's total nonspeech behaviors. For the young stutterers, 361 instances of 20 different nonspeech behaviors constituted approximately 80% of their total 445 instances of nonspeech behavior during 300 stuttered words. For the normally fluent children, 159 instances of 13 different nonspeech behaviors constituted approximately 80% of their total 190 instances of nonspeech behavior during 300 fluent words. Only the top 80% of each talker group's total nonspeech behavior was chosen for between-group comparisons because many of the nonspeech behaviors in the remaining 20% of each talker group's sample occurred very infrequently per subject or word or were exhibited by only 1–3 subjects per talker group. Percentages of total number of nonspeech behavior were arc-sine transformed prior to any application of inferential statistics to align the data with assumptions underlying such statistical procedures.

A series of Mann-Whitney *U* tests was used whereby the individual probability value (*p* value) per test = 0.002, with a simultaneous or overall alpha level of 0.05 for all 21 Mann-Whitney *U* tests. This procedure permitted between-group comparisons for 21 different nonspeech behaviors (20 exhibited by the young stutterers plus 1, torso forward, exhibited by normally fluent children but not by the young stutterers in their top 80%). In other words, of the 20 (80% of the total) nonspeech behaviors exhibited by the young stutterers, 12 were identical to the 13 (80% of the total) exhibited by the normally fluent youngsters.

Of these 21 between-groups comparisons, only the percentage of eyeballs move left (Mann-Whitney $U = 247$; $p < 0.002$), blinks ($U = 254$; $p < 0.002$), and upper lip raisers ($U = 210$; $p < 0.002$) were significantly higher for the young stutterers than for their normally fluent peers. Differences between the two talker groups for two other nonspeech behaviors—lip press ($U = 375$; $p = 0.02$) and jaw drop ($U = 375$; $p = 0.02$)—approached but did not reach the 0.002 *p* value. Figure 4 shows examples of each of the three nonspeech behaviors that were significantly different between the two talker groups, and Figure 5 shows the two nonspeech behaviors that approached but did not reach significance.

Duration of Eyeblinks

Analysis of duration (in ms) of young stutterers' eyeblinks was conducted because of implications from previous research that eyeblinks of certain durations are highly correlated with changes in cognitive activity and anxiety levels (e.g., Stern, Walrath, & Goldstein, 1984). There was, however, a nonsignificant difference (Mann-Whitney $U = 61.0$; $p = 0.95$) between the duration of the 35 blinks associated with the young stutterers' stutterings ($M = 185.3$ ms; $SD = 161.5$ ms) and the 7 blinks associated with the comparable fluent words produced by their normally fluent peers ($M = 171.8$ ms; $SD = 116.1$ ms). Similarly, there was neither a significant correlation ($r = 0.47$; $p = 0.35$) nor significant difference (Mann-Whitney $U = 112.0$; $p = 0.36$) between the duration of blinks associated with stuttering and the type of stuttering produced (i.e., sound/syllable repetition versus sound prolongation). Thus, although the two talker groups differ in terms of absolute frequency of eyelid blinks during speech, there is no appreciable difference in the durations of their blinks. Furthermore, the average duration of both talker groups' blinks combined ($M = 166.3$ ms; $SD = 139.0$ ms) suggests that they fall within the category of "endogenous blinks," which Stern et al. (1984) suggest are related to changes in cognitive activity and/or anxiety level.

TABLE 1. Nonspeech behaviors (NSB) exhibited by young stutterers and nonstuttering peers during 300 randomly selected instances of stuttering and 300 comparable fluent words, respectively. Each type of nonspeech behavior is expressed as a percent of total instances of nonspeech behaviors. These percentages, taken together, constitute approximately 80% of the young stutterers' total ($N = 445$) and nonstutters' total ($N = 190$) nonspeech behaviors. Also provided is the number of subjects, for both talker groups, exhibiting even one instance of a particular NSB. For purposes of between-group comparisons, data are provided (in parentheses) for those NSB not included in nonstutterers' or stutterers' top 80% of total instances of NSB.

	Stutterers (N = 30)			Nonstutterers (N = 30)		
	% total instances of NSB			% total instances of NSB		
Type of NSB	*M*	*SD*	No. subjects	*M*	*SD*	No. subjects
Head right	10.3	9.3	24	14.3	23.4	13
Head left	8.7	5.7	26	10.1	14.4	12
Blink	8.3	7.9	20	(3.3)	(8.4)	(5)
Lip raise	7.1	8.8	16	(0)	(0)	(0)
Combination	5.7	7.0	16	3.4	8.4	5
Lid raise	5.2	4.8	19	6.6	9.1	12
Eyes left	3.9	5.6	15	(0.4)	(2.3)	(1)
Right hand[a]	3.8	6.8	9	3.7	8.6	7
Head up	3.6	5.3	12	5.7	9.0	10
Head down	2.9	4.7	10	7.0	12.6	9
Lids close	2.9	5.9	7	4.2	9.9	8
Head tilt right	2.8	5.2	8	(1.5)	(4.2)	(4)
Eyes right	2.8	4.7	9	5.6	19.0	5
Lids droop	2.1	3.4	10	4.8	8.6	8
Torso right	1.8	3.5	8	5.2	11.2	6
Lip press	1.8	4.5	5	(0)	(0)	(0)
Jaw drop	1.7	4.7	5	(0)	(0)	(0)
Torso left	1.7	3.3	7	6.5	10.1	11
Head back	1.6	3.8	6	(2.7)	(6.5)	(5)
Head tilt left	1.5	3.0	7	(2.9)	(7.5)	(5)
Torso forward	(1.2)	(2.8)	(5)	5.1	8.8	9
Total	81.1			82.7		

Note. Combinations = the total number of co-occurring AUs, for example, cheek raise + upper lip raise. [a] = experimenter-defined behavior; all other nonspeech behavior based on FACS (Ekman & Friesen, 1978a, 1978b).

Nonspeech Behavior as Differentiator Between Children

Discriminant analysis (Cohen & Cohen, 1975, pp. 433–436; Silverman, 1985, pp. 189–191; Van de Geer, 1971, pp. 246–271) was used to identify those nonspeech behaviors that contributed most to differentiation between those children who stutter and those who are normally fluent. In essence, the discriminant analysis weights and linearly combines the nonspeech behaviors on which the youngsters who stutter and those who are normally fluent may be expected to differ, rendering the two groups as statistically different as possible. Thus, the absolute (i.e., disregarding sign) value or magnitude of each nonspeech behavior's weighting coefficient identifies the contribution that nonspeech behavior makes to the presence of stuttering in children. Table 2 presents the standardized weighting coefficients for the nonspeech behaviors that constituted 80% of the total behaviors for both the stuttering and the normally fluent children. This table indicates that head turn right contributed the most to the differentiation of young stutterers from their normally fluent peers and that various facial action combinations contributed the least. The adequacy of the derived discriminant equation can be assessed by using it to classify children as normally fluent or stuttering and determining the percent correctly classified. Such analysis would result in a comparison of the number of actual stutterers and normally fluent children in the sample versus the number of those predicted to be stutterers or normally fluent on the basis of the discriminant function.

Obviously, if a large proportion of the children who stutter or who are normally fluent are misclassified, we may surmise that the nonspeech behaviors are poor discriminators. As Table 3 shows, the 21 nonspeech behaviors,[4] when combined into a discriminant function, classify children as stutterers or normally fluent with a degree of accuracy

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[4] Essentially the same level and significance of talker-group discrimination was obtained whether all 21 nonspeech behaviors were used in the discriminant function or only the 13 most frequently occurring nonspeech behaviors produced by the normally fluent children.

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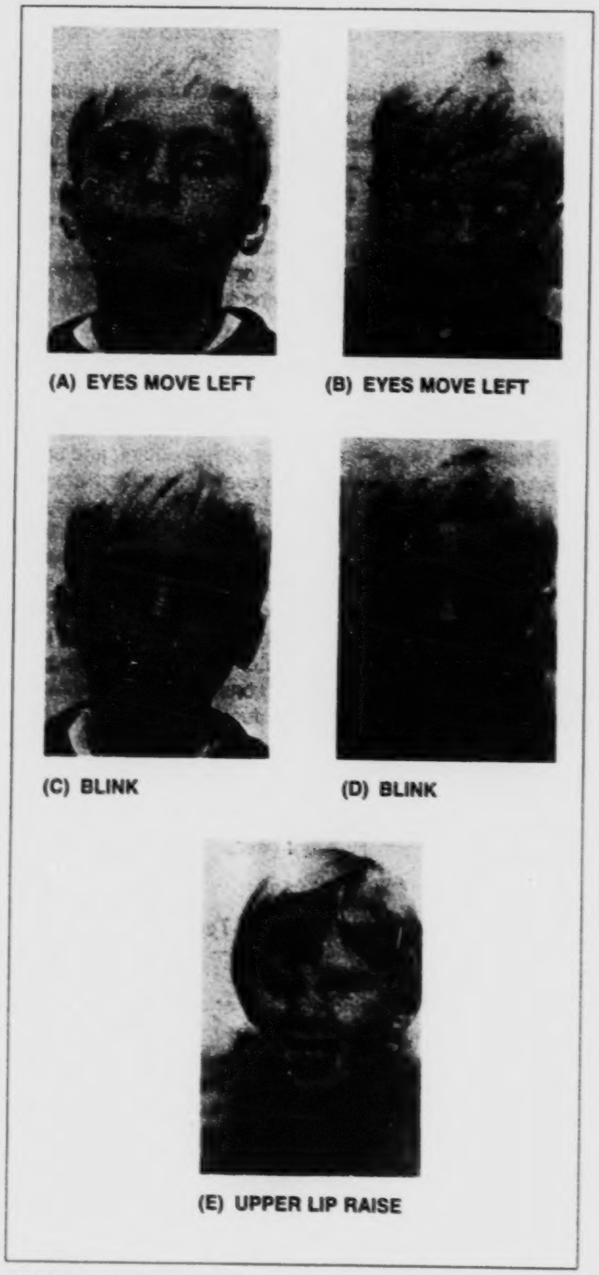
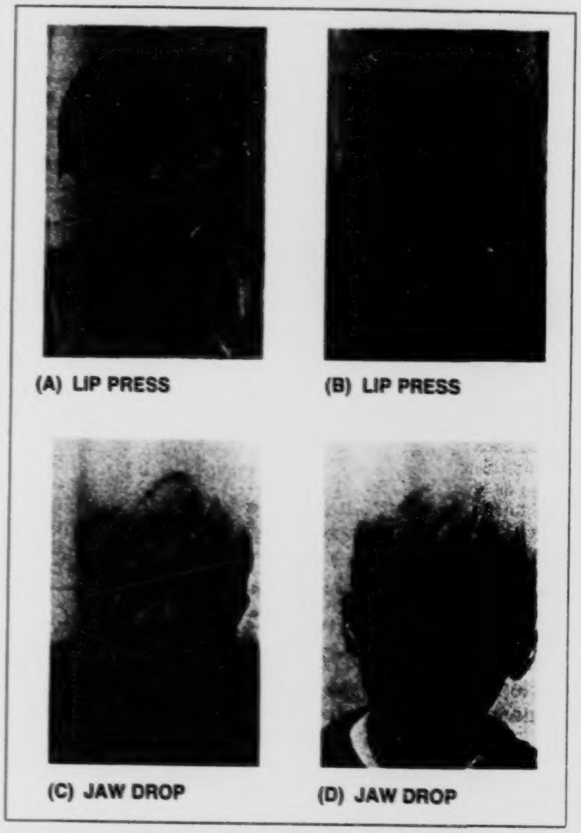


(A) EYES MOVE LEFT (B) EYES MOVE LEFT

(C) BLINK (D) BLINK

(E) UPPER LIP RAISE

FIGURE 4. Examples of three nonspeech behaviors that were produced significantly more often ($p < 0.002$) by young stutterers than young nonstutterers (where possible, clear, journal-quality photographs of two different children exhibiting each behavior are provided in this figure and Figure 5): *eyes move left* exhibited by two different children (A & B), closure portion of *blink* exhibited by two different children (C & D), and *upper lip raise* exhibited by one child (E).



(A) LIP PRESS (B) LIP PRESS

(C) JAW DROP (D) JAW DROP

FIGURE 5. Examples of two nonspeech behaviors that young stutterers produced nearly significantly more ($p = 0.02$) than young nonstutterers: *lip press* exhibited by two different children (A & B) and *jaw drop* exhibited by two different children (C & D). One example of jaw drop (C) is associated with a *upper lid raiser* type of nonspeech behavior, the latter behavior associated with jaw drop in only 1 or 2 of the 300 stuttered and 300 fluent words.

significantly greater than what would be expected by chance (chi square = 32.59; $df = 1$; $p < 0.001$). Thus, the classification of stutterer and normally fluent, at least in children, is not independent from the nature and number of these youngsters' exhibited nonspeech behaviors.

Discussion

The present findings indicate that young stutterers (ages 3–7 years) produce, on the average, about 1.48 nonspeech behaviors during their instances of stuttering and that the frequency and type of these behaviors significantly discriminate these children from their normally fluent peers. Although it is difficult to directly compare present findings with those reported in other studies, Schwartz, Zebrowski, and Conture (1990) found that young children who stutter (M age = 49 months) within 12 months of the onset of their problem produce an average of 1.1 nonspeech behaviors per stuttering. Likewise, Schwartz and Conture (1988), using a somewhat different criterion for assessing associated behaviors of a slightly larger, older sample of young stutterers (M = 71 months), reported 1.7 associated behaviors per stuttering. Thus, children in the present study

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TABLE 2. Standardized discriminant function coefficients listed in order of magnitude for sensitivity in classifying children as stutterers or nonstutterers.

Nonspeech Behavior	Weighting coefficient
Head turn right	0.646
Eyes move right	0.501
Upper lip raise	−0.483
Lower jaw drop	−0.479
Head turn left	−0.478
Head up	0.461
Torso left	0.413
Eyes move left	−0.392
Upper lid raise	0.360
Eyelids droop	0.344
Torso right	0.312
Head down	0.298
Lip press	−0.279
Head back	0.255
Eyelids blink	−0.240
Head tilt right	0.236
Right hand move	0.230
Head tilt left	0.149
Eyelids closed	0.141
Combinations	0.095

produced slightly more nonspeech behaviors than younger stutterers reported to be within 12 months of the onset of stuttering but somewhat fewer nonspeech behaviors than slightly older children who stutter (the latter may reasonably be assumed to be somewhat further from the onset of their problem than the children in the present study).

If, therefore, the number of associated behaviors per stuttering slowly increases as the problem continues, one would expect to find even more associated behaviors per stuttering in adults who stutter. Although it is difficult to compare our results directly to those of studies using somewhat different methodologies, adult stutterers reportedly produce an average of 2.33 associated behaviors per stuttering (Prins & Lohr, 1972). Krause's (1982) finding that adult stutterers produce an average of 16 nonspeech behaviors during a 20-s speech sample is difficult to relate to either the present findings or those of Prins and Lohr. However, Krause's finding that adult stutterers produce significantly more nonspeech behaviors than do normally fluent speakers is consistent with the present findings. Thus, young stutterers produce fewer associated behaviors per stuttering than adult stutterers, but it is also clear that these youngsters are producing associated nonspeech behaviors near the beginning of their problem (Schwartz, Zebrowski, & Conture, 1990). Unfortunately, in the present study, it was not possible to obtain reliable information from the parents of 12 of the 30 young stutterers regarding time of onset of their children's stuttering. Therefore, on the basis of present findings, we cannot be certain about the relation between young stutterers' chronological age, time since onset of their problem, and number of nonspeech behaviors. Thus, although data from this and related studies suggest the possibility of such a relationship, clarifying its nature must await further research.

Tests of Stuttering Severity That Rate Nonspeech Behavior

Both the Scale for Rating Severity of Stuttering (Johnson, Darley, & Spriestersbach, 1963) and the closely related Stuttering Severity Instrument (Riley, 1980), two widely used diagnostic tests for assessing severity of stuttering, include judgments of numbers of nonspeech behaviors as part of their criteria. Such judgments would seem to be one reasonable means of assessing young stutterers' stutterings in light of our finding that the frequency or number of nonspeech behaviors associated with stuttering significantly differs from that associated with comparable fluent words. It is unclear, however, which, if any, of the associated behaviors observed in the present study are of greatest import to either of the tests. Neither test would seem to emphasize any particular type of nonspeech behavior. Given the present findings that such behaviors as eye blinks, eyeball movement, and upper lip raising are significantly more prevalent in youngsters who stutter, it is quite possible that the occurrence of some types of nonspeech behavior, albeit brief in duration, may be a more sensitive index of the presence, likelihood, or severity of stuttering in children than a mere tabulation of the total number of all nonspeech behaviors associated with stuttering. In other words, both the overall number of these nonspeech behaviors *and* the frequency of specific types of nonspeech behavior should be considered when clinically evaluating childhood stuttering. Just as we have become sensitive to differences in the types of speech disfluencies that classify children as stutterers, we may also need to become sensitive to those types of associated nonspeech behaviors that young stutterers produce significantly more often than their normally fluent peers.

Differences in Frequency and Type of Nonspeech Behavior

There appears to be no absolute or categorical difference between children who stutter and their normally fluent peers in terms of the number and type of their speech disfluencies (Johnson & Associates, 1959; Conture, 1990a). Much the same can be said for the nonspeech behaviors exhibited by the two talker groups in the present study. Neither categorical nor absolute differences between the two talker groups were found, even though the young stutterers and normally fluent children differed in terms of the overall frequency of their nonspeech behavior and the frequency of specific types of nonspeech behavior.

However, we should not dismiss between-group differences based on frequency rather than type of behavior (in this case, young stutterers produced 133% more nonspeech behaviors during their stutterings than did normally fluent children during comparable fluent productions). Frequency of behavior is a pivotal distinguishing factor for a variety of human problems. For example, individuals who frequently drink too much are distinguishable from those who do so only occasionally; those who frequently exceed the speed limit are distinguishable from those who do so only on occasion, and so forth. In the case of young stutterers, the relatively

TABLE 3. Classification of children as either stutterers or normally fluent using the discriminant function based on 20 nonspeech behaviors. These 20 behaviors account for approximately 80% of the 47 most frequently occurring nonspeech behaviors exhibited by 30 young stutterers. Included were 12 of the 13 nonspeech behaviors that account for approximately 80% of the 30 young nonstutterers' nonspeech behavior.

Group	*N* of actual group	Predicted Group 1 (Nonstutterer)		Predicted Group 2 (Stutterer)	
		N	%	*N*	%
Nonstutterer	30	28	93	2	7
Stutterer	30	5	17	25	83

high frequency of occurrence of nonspeech behaviors when compared to that among their normally fluent peers means that they are doing something that everybody else does, but much more often. Perhaps, therefore, it is the overall frequency, rather than type, of young stutterers' nonspeech behavior that draws listener attention. Anything done excessively, or often enough to cross observers' perceptual thresholds or levels of tolerance, is apt to be noticed. Observers may simply notice that young stutterers produce more nonspeech behaviors during stuttering than their normally fluent peers. These same observers may have little appreciation or awareness of the specific types of nonspeech behaviors produced more frequently by young stutterers than normally fluent children, particularly if these types are brief in duration or similar to those that normally fluent children exhibit on occasion. However, these are empirical issues that can be solved only through a series of studies that relate observers' perceptual judgments of different frequencies and types of nonspeech behaviors to the identification of instances of stuttering and classification of stutterers.

Regardless of the outcome of such studies, it is still unclear why children, teenagers, or adults produce the frequency and type of associated behavior that they do during their stutterings. Certainly, some of these associated behaviors are what one would expect to observe during comparable fluent utterances. So to some degree the increased number during instances of stuttering reflects the fact that stutterings are longer than comparable fluent utterances,[5] thus allowing more time in which to exhibit such nonspeech behavior. Still, present findings indicate that these nonspeech behaviors can be used to successfully classify young stutterers and normally fluent speakers at an accuracy far greater than chance. Furthermore, differences in length of stuttered versus fluent words would not explain why young stutterers exhibit certain nonspeech behaviors—blinks, upper lip raising, and eye movements—significantly more often than do normally fluent speakers. Below we will explore some alternative explanations of our findings regarding young stutterers' associated behavior.

Why Young Stutterers May Produce Associated Nonspeech Behaviors During Stuttering

Overflow. Young stutterers' associated nonspeech behavior during stuttering could merely result from their concentrated effort to "get the word out." Like writers who may stick their tongues out between their teeth while painstakingly composing a story or weightlifters who exhibit horizontal forehead wrinkling and vertical furrowing of the eyebrows as they strain to lift a heavy weight, a young stutterer's associated behavior may simply reflect an "overflow" of concentrated mental, emotional, and physical effort to initiate or continue speaking.

One problem with this explanation is that it is unclear what behaviors like eyelid blinking, lateral eyeball movement, or upper lip raising have to do with a concerted effort to speak. Although some nonspeech behaviors associated with stuttering might be readily construed as reflecting concentration, it is almost certain that some others do not. Some may occur for different reasons, and it is quite possible that these different etiologies just like the resulting nonspeech behaviors, occur prior to, during, and shortly after stuttering. Some associated behaviors may be more related to the stutterer's real or perceived speaking difficulties, his or her reactions to these speaking difficulties, and listener reactions to his or her speaking difficulties. Similarly, some associated behaviors may reflect the concentration needed to deal with the mental, linguistic, emotional, or physical demands of speaking.

A reflection of the "person behind the symptoms." Sheehan (1958) suggested that during a stutterer's "struggles" with stuttering, the "secondary symptoms" may be "viewed as expressive behavior, projective of the person behind the symptoms, like other expressive behaviors. Since stuttering is such a stressful event for the stutterer, the manner in which he handles this stress becomes highly revealing" (p. 129). Sheehan apparently believed that stutterers' "secondary symptoms" reflect the stutterer's coping strategies or defense mechanisms (see Vaillant, 1977, pp. 7–12, 383–386 for detailed discussion of defense mechanisms) and that the exact nature of the "secondary symptoms" themselves provides insight into the nature of these strategies or mechanisms.

It is not the purpose of this discussion to refute or support Sheehan's suggestion but to briefly assess whether present observations of young stutterers' associated nonspeech behavior relate in any way to such speculation. It will be recalled that the present study found that on the average young stutterers produced about 1.48 nonspeech behaviors per stuttering. When judgments of facial expressions of emotion have been related to actual facial behavior (e.g., Wiggers, 1982), judges typically require at least two to three different "action units" to judge disgust, three to four to judge fear, two to three to judge happiness, and so forth. Therefore, most observers would appear to base their judgments of facial expressions of emotions on two or more action units as well as specific action units. If observers base their judgments of facial expressions on two or more action units, this may explain why young stutterers (between 3 and 7 years of age) who produce fewer than two action units per stuttering are not typically perceived as exhibiting emotional involvement with or reaction to their stutterings. In contrast, one might speculate that an individual very familiar with a child who stutters—for example, his or her mother—might view only one action unit during the child's stuttering and judge the child as being sad, happy, fearful, or the like. It is also possible that one action unit may be, according to the mother's perception, new or different from those previously exhibited by the child, and this may suggest to the mother that the child's behavior is changing for the worse, a change that may heighten the parent's concern about her child. Whatever the exact nature of the relation between mothers' judgments of their children's emotions and the number and nature of their children's nonspeech behaviors must await further study.

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[5] In this study, for instance, the young stutterers' stuttered words averaged 913 ms (*SD* = 184.38) in duration and their normally fluent peers' comparable fluent words averaged 342 ms (*SD* = 63.54).

Regarding Sheehan's (1958) speculation, however, young stutterers would not appear typically to provide enough facial gestures to permit observers to reliably judge the person behind the symptoms or at least the emotions that the child is experiencing. (Certainly, there is not enough behavior for a person who infrequently contacts the child, for example, the child's pediatrician, to detect such nonspeech behavior, let alone the person behind the behavior.) This makes sense when we consider that many youngsters who stutter exhibit far less than a fully developed cognitive or emotional awareness of their speaking difficulties (Bloodstein, 1960; Silverman & Williams, 1972). At the very least, it would seem that we may need different standards for evaluating the nature and number of facial expressions of emotion for children as for adults who stutter. And, while these standards may be relatively close to those applicable to adults, it is highly possible that they would differ at least in terms of number of behaviors.

A means of reducing aversive listener feedback. If young stutterers' associated behaviors are escape behavior (i.e., "a response that terminates an aversive stimulus *after* the stimulus has begun"; Reynolds, 1968, p. 103), they may become negatively reinforced by the temporary withdrawal or termination of aversive listener reactions. Thus, the young child who stutters may, by blinking his or her eyes or moving them to the left or the right, temporarily terminate aversive listener reactions—for example, a mother's facial expression of worry, disgust, or fear. Such reinforcement would, of course, lead to future increases in the child's exhibiting this associated behavior. And, as long as the child's associated behavior was at least intermittently reinforced by withdrawal or termination of aversive listener reactions, the child might continue exhibiting these associated behaviors. This sort of speculation is consistent with Brutten and Shoemaker's (1967) notion that events associated with stutterings such as eyeblinks and head jerks are examples of instrumental behavior and as such may be influenced by response-contingent positive or negative reinforcement.

What this sort of speculation assumes, however, is that the child exhibiting the associated behaviors watches the listener, finds the listener's reactions to be aversive or unpleasant, and thus attempts to minimize exposure to them. Although this may be true for some young stutterers or at least for some instances of stuttering, it is probably the case that the child who stutters, just like the normally fluent child, is not always closely watching or monitoring the face of his or her listener when talking. Thus, for termination of aversive listener reactions to serve as a negative reinforcer, the child would have to somehow attend to and evaluate the listener's responses. Although this hypothesis appears to be very plausible, at present there is no empirical evidence that children, particularly those the age of the children in this study, attend to, evaluate, and subsequently react to their listeners' reactions, or vice versa. And without this sort of evidence it is difficult to evaluate speculation that parents "react, *nonverbally* as a rule but verbally in some cases to [the child's stuttering] and to the child" (Johnson & Associates, 1959, p. 261) and the possibility that these sorts of parental or listener reactions are somehow related to the child's stuttering (Meyers & Freeman, 1985a, p. 205).

Perhaps young children who are either at risk or known to be stuttering exhibit nonspeech behaviors in reaction to their own within-word disfluencies. Their listener, usually a mother or father, may in turn exhibit nonspeech behaviors in reaction to the child's nonspeech reactions. Listener reactions, of course, have potential for being noticed by the child who, in turn, may react further. However, we must await the findings of further research to assess more adequately the possible bidirectional influence between a young stutterer's nonspeech behavior and that of his or her listeners (see Meyers, 1989; Meyers & Freeman, 1985b, 1985c; Stephenson-Opsal & Bernstein Ratner, 1988, for findings and discussion regarding young stutterers' speech behavior in relationship to their conversational partners' behavior).

An intended attempt-suppressing or unintended turn-yielding mechanism. One event that speakers and listeners try to minimize is simultaneous talking (termed *simultalking* by Conture and Caruso, 1987, p. 100). To avoid simultalking, participants in a conversation tend to take turns speaking and listening. To effect this turn-taking process (Dittman & Llewellyn, 1968; Duncan, 1972; Jaffe & Feldstein, 1970), it is believed that speakers and listeners exhibit what have been called *turn-taking signals*. That is, the listener may begin his or her speaking turn when the speaker provides the listener with a *turn-yielding* signal (Duncan, 1972). Conversely, the speaker maintains his or her turn by exhibiting an *attempt-suppressing* signal (Duncan, 1972). A speaker might terminate, for example, a hand gesture (a turn-yielding gesture) to signal the listener that it is his or her turn to talk or, conversely, continue hand gesticulation (an attempt-suppressing gesture) to maintain his or her talking turn. Young stutterers' associated behaviors may, therefore, function as either (a) intended attempt-suppressing signals that maintain the young stutterers' speaking turn (and keep the listener from interrupting) while the stutterer is having trouble completing the utterance or (b) unintended turn-yielding signals to the listener that the young stutterer is yielding the turn during the stuttering and that it is time for the listener to take his or her speaking turn.

These two possibilities are not mutually exclusive either within or between children who stutter. A youngster who stutters may intentionally avert eye contact during a stuttering to maintain the turn but during another stuttering terminate all hand gesticulation, thereby unintentionally signalling to the listener that it is his or her turn to talk. By averting his or her eyes, the young stutterer increases the chances that listeners will remain speechless (and may even hold their breath) and wait for the young stutterer to complete his or her turn. This waiting on the part of the listener gives the child more time to complete the utterance before the listener assumes his or her turn. Conversely, if the young stutterer terminates hand gestures during stuttering, the listener begins to talk while the young stutterer is still talking, which may place the child under increased time pressure to finish speaking, or to "spit" or "push" out the sound, syllable, or word. In essence, the listener's simultalking cues the young stutterer that speaking time is running out, that he had better hurry to complete his thoughts or finish his statements.

Actually, the use of associated behavior as an attempt-suppressing signal is a variation on the termination-of-aversive-listener-feedback hypothesis mentioned previously. That is, if the young stutterer's aversion of eye contact is a successful attempt-suppression mechanism leading to increased time to complete a stuttered utterance, then subsequent use of this behavior should increase. Such attempt-suppressing behavior is rewarded because it helps maintain the young stutterer's speaking turn, thus minimizing listener interruptions and ensuring continued listener attention.

It must also be remembered that associated behaviors are not the only form of turn-yielding or attempt-suppressing signals that young stutterers might use. Young stutterers (or other speakers) may, for example, change their pitch or intonation contours. In fact, Duncan's (1972) observation that a "drawl" on the final or stressed syllable is one of several turn-yielding signals suggests the possibility that prolonged sounds might trigger a listener's attempts to talk, even though the young stutterer is actually still talking (i.e., stuttering). It must also be pointed out that even though changes in gaze seem to function as a type of discourse regulation behavior in adults, it is still unclear whether young children change their ocular behavior (e.g., eyeblinking, aversion of eye contact) prior to, during, or after conversational turn exchanges (Craig & Gallagher, 1982). Thus, we must await further research to determine the exact relation of young stutterers' speech and nonspeech behaviors associated with stuttering and the role these behaviors may play as attempt-suppressing and turn-yielding signals.

Indicator of underlying processes. Stern et al. (1984) have discussed the finding that eyeblinks having certain durational as well as closing and opening characteristics are highly associated with changes in cognitive activity and/or anxiety levels (see Oster & Stern, 1980, for methodological details pertaining to study of eye movement). Such eyeblinks are termed "endogenous" and supposedly reflect underlying behaviors that differ from (a) reflexive eye closure to protect the eye from injury (e.g., dust), (b) volitional or "planned" eye closures (e.g., winking at someone), or (c) fatigue-induced eye closure associated with the onset of sleep. The average durations of the eye blinks of normally fluent and stuttering children—170–185 ms—are within the range of endogenous eyeblinks discussed by Stern et al. and may suggest cognitive or emotional activity associated with speech production. On the basis of the significant difference between the two talker groups in terms of number of eyeblinks (stutterers = 35 blinks, nonstutterers = 7 eyeblinks), it might be speculated that such cognitive or emotional activity may be more related to the production of stuttered than fluent speech. However, even though 20 stutterers as opposed to only 6 normally fluent children produced eyeblinks, this still leaves 10 stutterers who produced no discernible blinks during their stutterings. These apparent behavioral differences in eyeblinks among young stutterers are quite consistent with previous suggestions (e.g., Rentschler, 1984) and findings (e.g., Louko et al., 1990; Preus, 1981; Schwartz & Conture, 1988) that stutterers are not a homogeneous group. If eyeblinks of certain characteristics or duration are associated with certain cognitive or emotional activities and some but not other young stutterers tend to produce these eyeblinks during stuttering, such eyeblinks may serve as clues for the differential diagnosis of stuttering in children.

Whatever the case, further study of the relations among instances of stuttering, stuttering severity, associated number and duration of eyeblinks, and cognitive and emotional processes in childhood seems warranted. Such study is particularly germane in view of the finding that normally fluent adults' facial expressions seem to influence their autonomic nervous/vascular system activity (Ekman, Levenson, & Friesen, 1983; Zajonc, Murphy, & Inglehart, 1989) and the possibility that such activity, in turn, influences adults' subjective feelings. It is an empirical question whether young stutterers' nonspeech behaviors during stuttering also influence their autonomic nervous/vascular system activity and whether such activity, in turn, influences these youngsters' subjective feelings about speaking and their abilities to speak.

Some caveats. It was not possible, with this first study, to assess the pragmatic and linguistic variables associated with young stutterers' nonspeech behavior during stuttering. It was also not possible to assess the type, number, or time-course of the mothers' concomitant nonspeech behaviors. Likewise, it is not known what percentage of the time, just prior to or during a stuttering, a young stutterer visually monitors the facial expressions of his or her listener. Obviously, the child can only react to listener behaviors or reactions if attending to the listener, and this degree or percentage of child attention to the listener is still unclear.

We used the normally fluent peers' fluent utterances as a touchstone in contrast to the young stutterers' stutterings to determine, once and for all, whether the number and nature of young stutterers' associated behaviors are any different from those typically produced by their normally fluent peers. It would be equally interesting, but the subject of another study, to assess the normally fluent youngsters' associated behavior during within-word disfluencies. However, it should be noted that the 30 normally fluent children in this study produced very few within-word disfluencies per 100 words (*M* = 0.76; *SD* = 0.83). In fact many of them produced no within-word disfluencies per 100 words. Thus, comparing their associated behavior to those of young stutterers during within-word disfluencies would be problematic in terms of its representativeness. One might rectify this concern by forgetting about the number of normally fluent subjects who exhibit within-word disfluencies and collecting, for example, 100 within-word disfluencies from an unspecified number of normally fluent children. These disfluencies could then be compared to 100 randomly selected within-word disfluencies from an unspecified number of young stutterers. Whatever the case, this remains a issue for further investigation and outside the purview of the present study.

Unzner and Schneider's (1990) findings about the nonspeech behaviors of (presumably) normally fluent or typical 2- to 3½-year-olds as well as 3½- to 5-year-olds during structured game activities were comparable to present findings for upper lip raising and lip pressing (Unzner and Schneider did not report findings relative to blink or eyeballs moving): Both studies report that upper lip raising and lip pressing accounted for less than 1% of the total number of normally fluent youngsters' nonspeech behaviors. However, Unzner and Schneider also reported that their young (presumably) normally fluent subjects produced jaw drop for nearly 12% of their total number of nonspeech behaviors, whereas the normally fluent subjects in the current study produced jaw drop for less than 1% of their total nonspeech behavior. Perhaps the frequency of jaw drop differs between the two studies because in the current study we excluded from the data any nonspeech behavior like jaw drop that appeared to be part of the production of the stuttered or fluent sound, syllable, or word being analyzed, whereas such a procedure was not reported by Unzner and Schneider. Whatever the case, given the apparent differences in frequency of jaw drop between the two studies and in procedures pertinent to measuring this behavior, present findings of a nearly significant difference in jaw drop between young stutterers and normally fluent subjects should be viewed with caution.

Future research. The often-made comment that stutterers and their listeners frequently exhibit "frozen" facial expressions could not be readily assessed in this study. In fact, using FACS guidelines, the neutral (FACS coded as 0) FACS action unit indicates that the normally fluent children produced significantly more neutral face action units (*M* = 5.33 per subject; *SD* = 1.97) than the young stutterers (*M* = 2.3 per subject; *SD* = 1.44). The use of FACS for studying "frozen" faces may be questionable because a FACS "neutral" is scored only when there is a complete absence of facial behavior, and the "frozen" face that clinicians often mention may indeed contain some facial action units or facial behaviors. One possible solution would entail having a panel of judges consisting of clinicians experienced with diagnosing and remediating stuttering systematically view videotape recordings of stutterers' facial expressions during stutterings and identify those facial expressions that they would label as "frozen" with a high degree of certainty. Those facial expressions so labelled could then be assessed, using FACS, to determine the number and nature of facial action units highly associated with so-called "frozen" facial gestures.

Concluding remarks. Children who stutter exhibit more nonspeech behaviors during their stutterings than do their normally fluent peers. There is, however, a great deal of overlap between the two talker groups with regard to many of the types of nonspeech behaviors exhibited. The nature of two of the three nonspeech behaviors that differed between the two talker groups (eyeball movement to the left and eyelid blinking) suggests that young stutterers attempt to minimize the amount of listener feedback they receive. The third nonspeech behavior (upper lip raising) may be associated with stutterers' "quivering of the nostrils" (Bloodstein, 1987, p. 18) or instances when they "flare their nostrils" (Van Riper, 1982, p. 123). Upper lip raising and quivering or flaring of the nostrils could be related to inappropriate attempts at inhalation or may be part of the facial expression of disgust. Nonspeech behaviors appear to classify or distinguish between young stutterers and nonstutterers to a significant degree. Continued research is needed, however, to assess the most parsimonious means by which these behaviors can be used to distinguish between the two talker groups. Although there is nothing in the present findings to suggest that nonspeech behaviors cause instances of within-word disfluencies (i.e., stuttering), findings do suggest that nonspeech behaviors (a) are highly associated with young stutterers' stutterings, (b) have potential for maintaining and/or exacerbating stuttering through a complex bidirectional interaction with listener reactions (Meyers & Freeman, 1985a, p. 205), and (c) may occur for several different reasons both within and between children who stutter. Indeed, the nonspeech behaviors associated with childhood stuttering appear to be a rich source of information about stuttering from its onset onward and seemingly deserve continued empirical investigation.

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Appendix

A listing of the 44 Facial Action Coding System's (FACS) 44 action units (AUs), 14 more grossly defined action units pertaining to head and eyeball position (cf. Ekman & Friesen, 1978a, 1978b), and 8 experimenter-defined actions. None of these 66 nonspeech behaviors was scored or included as data for this study if it involved or appeared to involve (a) speech-related gestures, movements or behaviors, (b) object adaptor, or (c) self-adaptor (see text) use of face, hands, arms, and upper torso.

Upper Face AUs

Inner brow raise
Outer brow raise
Brow lower
Upper lid raise
Cheek raise
Lids tight
Lids droop
Slit
Closed
Squint
Blink
Wink

Lower Face AUs

Nose wrinkle
Upper lip raise
Lip corner depress
Lower lip depress
Chin raise
Lips part
Jaw drop
Mouth stretch
Dimpler
Lip stretch
Nasolabial deepen
Lip corner pull
Cheek puff
Lip pucker
Lip funnel
Lip tight
Lip press
Lip suck

Miscellaneous AUs

Lips toward
Tongue show
Neck tighten
Jaw thrust
Jaw to sideways
Jaw clench
Bite
Blow
Puff
Cheek suck
Tongue bulge
Lip wipe
Nostril dilate
Nostril compress

Head Position

Turnleft
Turn right
Head up
Head down
Tilt left
Tilt right

Eye position

Left
Right
Up
Down
Walleye
Crosseye

Neutral/Nonviewable

Neutral
Unscorable
Brows not visible
Eyes not visible
Lower face not visible
Entire face not visible

Experimenter-Defined Hand, Arm, & Upper Torso Movements

Right hand
Left hand
Right arm
Left arm
Upper torso forward, back, lean left, or lean right

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BEHAVIORS AT THE ONSET OF STUTTERING

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The purpose of this investigation was to identify speech and nonspeech behaviors associated with the stuttering of children close to the onset of their problem. Ten stuttering children (nine boys and one girl) were identified through a) parent interviews indicating that these children begun stuttering during the previous 12 months prior to data collection, and b) the presence of 3 or more stutterings per 100 words of conversational speech. Fourteen associated speech and nonspeech behaviors and speech dysfluency type were identified and quantified for 10 stutterings from each of the 10 subjects. The 14 associated behaviors and speech dysfluency type were further reduced to form three indices: a) Sound Prolongation Index, b) Nonspeech Behavior Index, and c) Behavioral Variety Index. Results indicated that all of the children exhibited speech and nonspeech behaviors in association with their stuttering. Additionally, chronological age did not significantly correlate with any of the three indices investigated. Findings are taken to suggest that the quantification of speech dysfluency type and the speech and nonspeech behaviors associated with stuttering are more sensitive than chronological age as indicators of the development of stuttering.

INTRODUCTION

Despite much speculation (e.g., Bloodstein, 1960a,b, 1961) and retrospective verbal reports of parents (e.g., Johnson and Associates, 1959), there is little objective information regarding the number and nature of speech and nonspeech behaviors produced by children close to the onset of stuttering. Recently, however, Yairi and Lewis (1984) directly examined the speech dysfluencies of young stutterers at or near the onset of stuttering as well as those produced by normally fluent peers and found differences in the frequency and type of speech dysfluencies between these two talker groups. Similarly, Schwartz and Conture (1988), in a

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study of the speech and nonspeech behavior associated with the stutterings of 43 young stutterers, speculated that ". . . from the onset, or at least near the onset of their problem, youngsters who stutter exhibit behaviors that heretofore were regarded as characterizing only more advanced or established stuttering problems" (p. 68).

Because Schwartz and Conture did not report the time since onset (i.e., the length of time between the date of onset and the date of experimental assessment) for their young stuttering subjects, they were unable to assess quantitatively the relation between young stutterers' time since onset and the nature and number of their speech and nonspeech behavior. Conture and Kelly (1988), in a study of the nonverbal behaviors associated with 30 young stutterers' and 30 normally fluent peers' comparable fluent utterances, did obtain reliable parental reports of the time since onset (mean = 17.8 months; range 3–35 months) from the parents of 19 of their 30 young stutterers. However, because of the extreme variability of the 19 young stutterers' time since onset as well as missing data for 11 subjects, it is somewhat difficult to use this data to assess the relation between time since onset and speech and nonspeech behaviors.

Therefore, on the basis of available empiric evidence, it is quite difficult to assess adequately popular speculations that speech and nonspeech behavior associated with stuttering are most likely to be exhibited *after* the stuttering problem has fully developed (e.g., Brutten and Shoemaker, 1967). Similarly, it is difficult to assess objectively whether such behaviors are produced in *later* stages of the development of stuttering as reactions to sound/syllable repetitions or sound prolongations (Conture, 1982) or whether these behaviors are learned as a means of coping with the core behavior of stuttering, that is, within-word dysfluencies (Wingate, 1964). It is quite possible that many of these so-called later developing speech and nonspeech behaviors are present right from the beginning, that is, at or near the time of onset of stuttering. What is needed, therefore, is objective, empirical assessment of young stutterers' speech and nonspeech behaviors at or near the onset of stuttering.

It is recognized that such research has been attempted before (e.g., Johnson & Associates, 1959). However, one weakness of these earlier attempts to assess speech and nonspeech behavior at or near the time of onset is that the investigators often relied upon retrospective verbal reports of parents that were obtained during an extensive interview process. Furthermore, these earlier studies made no reported attempt to control for time since onset, that is, only assess behaviors of those children whose reported onset was 12 months or less. While we still must rely on parental report to establish the approximate time of onset, it should be possible to make objective, empiric observations of young stutterers' speech and nonspeech behavior independent from their parents' verbal reports of same, relatively close to the time of reported onset. Obtaining this information should help us better understand the nature and number of speech and nonspeech behaviors that occur at or near the onset of the problem and serve as a basis for subsequent comparison to young stutterers who are known to have been stuttering for several months or years since onset.

We speculate that young stutterers, at or near the time of onset, are producing a relatively large number and wide variety of associated speech and nonspeech behaviors during their stuttering. While the number and nature of these behaviors may subsequently change with time and experience, we believe that, right from the beginning of their problem, young stutterers are exhibiting a frequency and type of behavior that heretofore were thought only to characterize more advanced or established stuttering problems. To assess this hypothesis, the purpose of the present investigation was to assess objectively the number and nature of behaviors associated with stuttering in young stutterers close to stuttering onset.

METHOD

Subjects

Ten young stutterers from the central New York region took part in this investigation. Subjects in the present investigation were the same subjects reported by Zebrowski and Conture (1989), although different measures were analyzed during this study. Referral was made by either the child's parents, speech/language pathologists, or day-care or nursery school personnel following the solicitation of subjects. Of the 10 stutterers, one was enrolled in speech-language therapy at the time of data collection. These 10 young stutterers (nine boys and one girl) had a mean age of 4:1 (years:months; range: 3:2–5:0). All subjects exhibited at least 3 stutterings per 100 words of conversational speech in the form of sound/syllable repetitions and sound prolongations. Their mean stuttering frequency was 8 stutterings per 100 words of conversational speech (range: 3–16 stutterings per 100 words of conversation). Mean duration of the measured stutterings was 0.98 seconds (range: 0.77–1.2 seconds).

All stuttering children were within 12 months of stuttering onset as reported by their mothers. An in-depth interview was conducted with each mother to help her to focus on the approximate time (month, year) and location of her child's stuttering onset. Only children whose mothers reported the onset of stuttering within the preceding 12 months were used in this study. The average interval between mothers' reported onset of stuttering and data collection was 8½ months (range: 1–12 months). A total of three possible stuttering subjects (all boys; ages 4:10, 4:5, and 3:9) were not included because interview responses from their mothers indicated that stuttering onset occurred more than 12 months previously.

All young stutterers exhibited intelligible speech, age appropriate expressive/receptive language functioning, normal hearing acuity, and normal middle-ear function. Subjects were paid volunteers who were unaware of the purpose and method of this investigation.

Collection of Speech Samples

To obtain samples of stuttered speech and its associated behaviors, each child engaged in conversation with his or her mother. To facilitate spontaneous speech, a standard set of toys was provided to stimulate conversation (Miller, 1981). Mothers were instructed to talk about topics of their choice, and discussion about the toys provided was voluntary. Each mother–child pair continued conversation until at least one 300-word sample was obtained and recorded for each child (mean sample duration = 8 minutes: 28 seconds, range = 4:27–14:27).

The parent–child interaction was simultaneously audio- and videorecorded at 30 frames per second (60 video fields per second) on a ¾-in. videocassette for later analysis. To assist in identifying the location of each stuttering during future analysis, a time code generator produced a visually apparent video time code (minutes:seconds:frames) that was simultaneously recorded.

Behavioral Data Measurement and Analysis

Data analysis procedures are similar to those reported by Conture and Schwartz (1984) and Schwartz and Conture (1988). To insure an accurate description of the behaviors associated with stuttering, the following procedures were necessary: a) identification of the beginning and end of a sample of each child's conversational speech from the audio-/videorecording; b) notation of the approximate beginning and end of each stuttering (i.e., sound/syllable repetition, sound prolongation) using the visually apparent time code; c) determination of the type of stuttering (sound/syllable repetition, sound prolongation) for each stuttering identified in the conversational sample; and d) random selection of 10 stutterings from each child for behavioral analysis.

Previous work by Conture and Schwartz (1984), and Schwartz and Conture (1988) reported that although young stutterers exhibit a variety of behaviors in association with their stuttering, 14 behaviors can be consistently and reliably measured in association with stuttering (see Table 1).

Quantification of Associated Behavior. Behaviors associated with the 10 randomly selected stutterings for each of the 10 stutterers (100 stut-

Table 1. Summary of the 14 Behavioral Events Obtained Through Frame-by-Frame Audio/Video Observation of Stuttering Exhibited by 43 Young Stutterers

Behavioral events
1. Eyelid opening and closing
2. Eyeball movement (lateral or vertical)
3. Head movement
4. Limb movement
5. Torso movement
6. Whole-word repetition
7. Interjection
8. Revision
9. Audible inhalation
10. Vocal intensity change
11. Phrase repetition
12. Audible exhalation
13. Lip movement
14. Other

Source: After Schwartz and Conture (1988).

[a] Ranging in age from 3 years 1 month to 9 years 4 months.

terings in total) were identified and quantified. In order to quantify these behaviors, it was necessary to:

1. Locate the exact beginning and end of each instance of stuttering using a video editing unit (Sony, BVE 200A). The video editor enabled the examiner to note the visible time code and view each stuttering from stop motion through real time.
2. View each stuttering from its apparent beginning to end. This process occurred as many times as necessary to insure that all visually and audibly apparent behaviors associated with an instance of stuttering were noted.

Formation of Speech and Behavioral Indices. Schwartz and Conture (1988, pp. 64–65) previously reported that three indices related to stuttering type and the number and variety of associated behaviors may be used to differentiate among young stutterers:

1. *Sound Prolongation Index* (*SPI*): the total number of sound prolongations divided by the total number of stutterings in the conversational sample.
2. *Nonspeech Behavior Index* (*NBI*): the average number of nonspeech behaviors per stuttering.
3. *Behavioral Variety Index* (*BVI*): the average number of different behavior types per stuttering.

For each of the 10 subjects, the SPI, NBI, and BVI were calculated.

Intra- and Interjudge Reliability

Two stutterings were randomly selected from each subject ($n = 20$ stutterings) to determine the first author's intrajudge reliability of behavioral measures. Behaviors associated with each of the 20 stutterings were used to calculate the NBI and BVI for all stutterings. The mean difference value for intrajudge agreement was 0 for NBI ($SE = 0.17$) and 0 for BVI ($SE = 0.15$). Interjudge reliability for these behavioral measures has been reported previously (Schwartz and Conture, 1988). Intra- and interjudge reliability for frequency and type of stuttering have also been previously reported (Schwartz and Conture, 1988).

RESULTS

Table 2 presents the indices of stuttering and behavioral data for each of the 10 young stutterers. Regardless of interval between the onset of stuttering and data collection, each of the 10 young stutterers exhibited behaviors in association with their stuttering. The number of nonspeech behaviors (NBI) ranged from 0.6 to 1.9 behaviors with a mean of 1.09 nonspeech behaviors per stuttering. The variety of behaviors (BVI) ranged from 0.7 to 2.2 behaviors with a mean of 1.29 different behaviors per stuttering.

The most frequently produced stuttering type (sound/syllable repetition or sound prolongation) was determined by calculation of the SPI for each child. Examination of Table 2 reveals that the mean SPI was 43.9% (range = 33%–60% sound prolongations). A SPI of 43.9% indicates that sound/syllable repetitions were the most frequently occurring stuttering type produced by the children in this study.

To examine the possible relationship between each of the three behavioral indices (SPI, NBI, SPI) with a) the child's chronological age, b) the duration of the interval between the onset of stuttering and data collection, c) the frequency of stuttering, and d) the duration of stuttering, a Spearman rho correlation was completed (see Table 3). Examination of Table 3 revealed a moderate correlation between duration of the interval between the onset of stuttering and data collection with the most frequently occurring speech dysfluency type (rho = 0.577). However, examination of the Index of Determination to determine the amount of shared variance (Ventry and Schiavetti, 1980) revealed $r^2 = .33$, indicating that 67% of the variance could not be accounted for in this correlation. Further examination of the remaining relationships revealed little or no correlation between the behavioral indices and chronologic age, frequency, or duration of stuttering.

Table 2. Summary Table of 10 Young Stutterers[a]

Subject	Age	Onset	SPI	NBI	BVI
1	38	1	36	0.6	0.7
2	48	7	36	1.4	2.2
3	60	7	33	1.9	1.9
4	51	8	33	0.8	1.2
5	60	8	51	1.3	1.8
6	41	9	53	1.1	1.0
7	52	11	58	0.7	0.5
8	39	11	60	0.8	1.0
9	46	12	41	1.3	1.7
10	54	12	38	1.0	0.9

[a] Includes their chronologic age (Age, in months), the time from the onset of stuttering to data collection (Onset, in months), and three behavioral indexes: Sound Prolongation Index (SPI) = percentage of sound prolongations determined from obtained conversational sample; Nonspeech Behavior Index (NBI) = the average number of nonspeech behaviors per stuttering); and Behavioral Variety Index (BVI) = average number of different behaviors per stuttering. The ten stuttering children are rank ordered according to the time since the onset of the problem.

DISCUSSION

Findings support Schwartz and Conture's (1988) hypothesis that all children who stutter regardless of the duration from the onset of the problem produce behaviors in association with their stuttering. Schwartz and Conture (1988) hypothesized that the children placed in clusters 1 and 2 in their investigation were children ". . . who appear to be in the earliest stages of the development of the stuttering problem. . . ." These investigators concluded, "Thus, it appears that from the onset, or at least near the onset of their problem, youngsters who stutter exhibit behaviors that

Table 3. Spearman-Rho Correlations[a]

	SPI	NBI	BVI
Age	−.254	.486	.348
Onset	.577	−.105	−.329
Frequency	.248	.344	.139
Duration	−.367	−.018	−.241

[a] For the chronologic age (Age, in months), duration of interval from onset of stuttering to data collection (Onset, in months), frequency of stuttering (Frequency, per 100 words of conversational speech), mean duration of stuttering (Duration) with three behavioral indexes: (Sound Prolongation Index (SPI) = percentage of sound prolongations determined from obtained conversational sample; Behavioral Variety Index (BVI) = average number of different behaviors per Stuttering; and Nonspeech Behavior Index (NBI) = the average number of nonspeech behaviors per stuttering).

heretofore were regarded as characterizing only more advanced or established stuttering problems." When subjects in the present study were compared to those of Schwartz and Conture, all of the 10 children could be categorized as cluster 1 (8 children) or cluster 2 (2 children).

While clinical reports suggest that the presence of behaviors associated with stuttering characterize the later stages of stuttering development (e.g., Bloodstein, 1987), the observation of associated behaviors in children close to the onset of stuttering suggests that the quantification of the number and variety of associated behaviors should be a part of a routine evaluation of stuttering with all age clients, regardless of how close they are to the onset of the problem.

While such measures as stuttering frequency and the SPI are often viewed to be quantitative measures reflecting stuttering severity and development, associated behaviors provide additional objective information related to a child's awareness of, or reactions to, his stuttering. Schwartz and Conture (1988) suggest the following:

> . . . those children who exhibit the largest number and variety of behaviors . . . may be signaling to the trained observer, a keener awareness of their stuttering as well as more frequent and varied attempts to adjust or to respond to the problem, and therefore, are more in need of direct therapeutic intervention. (p. 69)

Although results from this investigation support Schwartz and Conture's (1988) observation that 14 speech and nonspeech behaviors are most consistently associated with stuttering, it was evident throughout this study that those behaviors characterized by facial actions (e.g., eye movement left or right, eye opening and closing) occurred most frequently. As a result, future investigators may want to refine the process and use such procedures as *The Facial Action Coding System* (Ekman and Friesen, 1978), which permits the investigator to objectively assess the specific muscle actions used by an individual speaker without reference to the speaker's reason or intentions "behind" the facial activity. With such knowledge of facial actions, investigators can begin to explore the relationship between facial actions and facial expressions (Wiggers, 1982) and ultimately the relationship between facial actions, facial expressions, and stuttering.

The lack of any strong relationship between chronologic age and 1) the frequency of stuttering, 2) duration of stuttering, 3) type of stuttering, or 4) number and variety of associated behaviors suggests that we need to revise our thinking regarding stuttering development. Specifically, when trying to develop an indicator of stuttering severity and chronicity, we need to concentrate on differences or changes in stuttering type as well as the number and variety of associated behaviors, rather than focusing on the child's chronologic age. On the other hand, chronologic age can provide important information relative to expected maturity levels and emotional development that may prove useful for the development of therapy or remedial programs.

In conclusion, it no longer appears satisfactory to wait for the problem of stuttering to develop before we objectively evaluate the types of stuttering a child is producing or the number and variety of associated behaviors. From our initial contact with a referring agency or parents, through our clinical evaluation of the child, we need to recognize that most children will exhibit some behaviors in association with their stuttering. Finally, our ability to examine stuttering and its associated behaviors objectively should provide a speech-language pathologist with additional information regarding a child's intellectual and/or emotional awareness or reactions to stuttering, as well as aid in the prognosis of the problem.

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EYE CONTACT BETWEEN YOUNG STUTTERERS AND THEIR MOTHERS

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ABSTRACT:

The purpose of the present study was to assess young stutterers' and their mothers' eye contact during stuttered and fluent utterances and that exhibited by normally fluent children and their mothers during comparable utterances. Subjects were 10 male stuttering children (mean age = 57.0 mo) and a like number of age- and sex-matched (+/- 4 mo) normally fluent boys (mean age = 56.8 mo) and their respective mothers. Each mother and child were audio-videotape recorded while they engaged in a thirty-minute conversation, and mother-child eye contact was assessed during ten randomly selected stuttered and ten fluent words for each young stutterer, and ten fluent and 22 stuttered (approximately 2 per subject) words for each normally fluent peer. All stuttered and fluent words were matched for variables known to influence speech dysfluency (e.g., word length). Results indicated that eye contact was significantly more frequent for young stutterers and their mothers during stuttering than for normally fluent peers and their mothers during fluency. In essence, normally fluent children and their mothers gazed elsewhere other than towards each others' faces significantly more often during fluency than young stutterers and their mothers did during stuttering. During stutterings, there were no significant differences in gaze and ocular-related behavior between normally fluent and stuttering children. Findings are taken to suggest that mothers of young stutterers may look to monitor her child's behavior as he stutters, and/or look to inform her stuttering child that she is attending to him.

It has often been suggested that during conversations between young stutterers and their parents, behaviors affecting the amount and nature of "eye contact"[1] may exacerbate and/or maintain a child's stuttering (e.g., Ainsworth & Fraser, 1988; Conture, 1990; Guitar & Conture, 1989, Van Riper, 1986). For example, Guitar and Conture (1989) advise parents of young stuttering children to "keep natural eye contact when the child is talking," without giving a quantitative and qualitative description of the criteria for judging "natural eye contact." Ainsworth and Fraser (1988) advise parents to "look at" their child (p. 31), and to "notice...the way he looks or doesn't look at you (p. 26)." Despite these various clinical suggestions, there is little objective information regarding the relationship between parent-child eye contact and youngsters' stuttered or fluent conversational speech. There have been, however, some studies of "eye contact" in adults who stutter.

For example, Jensen, Markel, and Beverung (1986) reported that adult stutterers demonstrated significantly less eye contact than nonstutterers before and after, but not during word production; however, Jensen et al.'s analysis was based on a "word association" paradigm, rather than conversational speech. Krause (1982) studied "loss of eye contact", as well as other related nonspeech behaviors, during the conversations of adult stutterers, labeled both "manifest" and "non-manifest" (i.e., those who do and do not produce perceptually apparent stutterings), as they conversed with normal adult speakers. Krause reported that manifest stutterers "partly or totally closed" their eyelids for 22% of the time they were speaking, as opposed to about 12% for normally fluent speakers. Krause interpreted his findings to suggest that adult stutterers may attempt to "avoid affect," such as aversive facial expressions, in order to cope with an unfamiliar conversational partner. In contrast, Wingate (1988) suggests that stutterers and those who research stutterers often over-emphasize the "emotional reasons" (e.g., "shame and embarrassment") why stutterers may look away while speaking. Instead, Wingate suggests that speakers tend to avert gaze while planning more difficult utterances (e.g., Kinsbourne, 1972; Gur, 1975). Wingate implies that speakers may, quite literally, be "searching for the right words."

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[1] "Eye contact" may be defined as occurring when the eyeballs of one person and those of another are perceived as being oriented towards each other's faces (i.e., two co-occurring individual gazes). This situation is difficult to perceptually distinguish from the situation where persons are gazing directly into each other's eyes (i.e., "eye-to-eye contact"). Hence, for the purpose of the present study, both situations will be considered as evidence of "eye contact," or, as referred to by others, "mutual gaze" (e.g., Argyle & Cook, 1976).

However, the degree to which one can readily extrapolate behaviors exhibited by adult stutterers to those produced by children who stutter is unclear. For example, young stutterers have a relatively brief history of stuttering, and thus it is possible that the frequency and nature of their speech and associated nonspeech behavior is quite different from that of adults (Conture, 1987). Further, because the onset of stuttering typically occurs before seven years of age, stuttering has increasingly come to be recognized as a "disorder of childhood" (e.g., Bloodstein, 1987; Conture, 1990). Therefore, it would seem that one of the better ways to understand the onset and development of stuttering and its associated behaviors is to study the nature of stuttering in children (e.g.. Conture, 1987; Caruso, Conture & Colton, 1988) in naturalistic conversations between young stutterers and their listeners (e.g., Meyers, 1989; Stephenson-Opsal & Bernstein Ratner, 1988). Obtaining more objective information regarding young stutterers' eye contact during stutterings should improve our currently limited understanding of these youngsters' "associated," "accessory," "secondary" or "physical concomitant" behaviors which many believe have clinical significance (e.g., Bloodstein, 1987; Riley, 1980; Van Riper, 1982, 1986).

Typical conversational partners of young stutterers are their parents. In fact, the parent most likely to be the first and/or sole "informant" about the child's stuttering is the mother (Zebrowski & Conture, 1989, p. 626). Possibly, the frequency and nature of eye contact that occurs between young stutterers and their mothers differs from that which occurs between normally fluent children and their mothers, and these differences may contribute to the aggravation and/or maintenance of the child's stuttering. For this reason, the quantity as well as quality of eye contact between youngsters who stutter and their mothers is of interest.

Thus, more information seems to be needed about differences in nonspeech behaviors between parent and child populations. These differences would seem to be best revealed during the young child's stutterings, that is, at those times when parents are thought to be most apt to nonverbally react to their child's speech (Johnson & Associates, 1959). Until more is known about eye contact between young stutterers and their parents versus their normally fluent peers' words during conversation, it will be difficult to assess speculation that parents tend to "...react, nonverbally as a rule but verbally in some cases" (Johnson & Associates, 1959, pp. 261-262) to the child and to the child's dysfluent speech. Indeed, if no appreciable differences in listener-speaker eye contact exist between young stutterers' stutterings and their normally fluent peers' fluent productions matched for variables known to influence speech dysfluency (e.g., length of word), then it would seem to be difficult to suggest that eye contact significantly contributes to the aggravation or maintenance of stuttered as opposed to fluent speech production.

Therefore, the present study is designed to answer the following questions: First, during stuttered and fluent words, do young stutterers and/or their mothers differ from normally fluent peers and/or their mothers regarding frequency and nature of eye contact? Secondly, during stuttered and fluent words, do children who stutter and/or their mothers differ from normally fluent peers and/or their mothers in terms of the type of eyelid, eyeball, and head behaviors associated with the making or breaking of eye contact between speaker and listener? Thirdly, within talker groups, how does the frequency and nature of eye contact differ between young stutterers' stuttered versus fluent word production, as well as between normally fluent children's stuttered versus fluent word production?

METHODS

Subjects. Subjects for this study were 20 monolingual, English-speaking mother-child pairs: 10 stuttering boys and their mothers, and 10 normally fluent boys and their mothers, with each stuttering child matched in age (+/- 4 months) to a normally fluent child. Stuttering children were referred to a speech and hearing clinic by one or both of the child's parents, and/or a professional, because of known or suspected stuttering. Normally fluent children and their mothers were recruited through local advertising, and all children were from the central New York state region. There were no known or reported hearing, neurological, developmental, academic, intellectual or emotional problems in any of the 20 subjects, and all were videotaped prior to any prescribed therapy. Although all subjects produced intelligible speech, some children in both talker groups demonstrated various types and numbers of phonological processes in their speech samples (Louko, Edwards, & Conture, 1990); however, only perceptually intelligible stuttered and fluent words were analyzed in terms of associated nonspeech behaviors. All 20 subjects were paid volunteers who were naive with regard to the precise purposes and methods of the study.

The young stutterers were 10 males with a mean age of 57.0 months (SD = 9.5 months), and mean approximate time since onset of the stuttering problem, by parental report, was 23.9 months (SD = 8.0 months). Mother's report and/or previous diagnosis by a speech-language pathologist was used as the initial criterion for inclusion in the stuttering group. Following participation in a 30- to 35-minute videotaping session, two certified speech-language pathologists assessed each child's stuttering behaviors.

For inclusion in the stuttering group, a child had to meet both of the following criteria: (1) produce three or more stutterings[2] per 100 words during a 300-word sample of conversational speech collected during the videotaped interaction with the child's mother; and (2) must have adult listeners who expressed concern over the child's speech fluency and/or believed that the child was a "stutterer" or at high risk for becoming one (e.g., Zebrowski & Conture, 1989). The mean stuttering frequency of the young stutterers was 12.0 stutterings per

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[2] "Stutterings" have been defined for the purpose of this study as "within-word disfluencies" (Conture, 1990), which include sound-syllable repetitions, monosyllabic whole-word repetitions, sound prolongations, and within-word pauses.

100 words of conversational speech (SD = 6.2) with a range of 5 to 26 stutterings per 100 words. This frequency of stutterings is consistent with that reported elsewhere for stuttering children (e.g., Johnson et al., 1959; Yairi & Lewis, 1984).

Based on the Stuttering Severity Instrument (SSI; Riley, 1980), three young stutterers received a stuttering severity rating of "mild", six subjects were rated "moderate", and one subject was rated "severe". Their overall as well as component parts of their SSI scores are presented in Table 1.

TABLE 1 ABOUT HERE

The young normally fluent children were ten males with a mean age of 56.8 months (SD = 11.0 months). These children were selected from those whose mothers responded to a local newspaper advertisement that sought "typical 3 to 7 year-old children and their mothers to participate in a study of mother/child conversations." For inclusion in the normally fluent group, a child had to meet both of the following criteria: (1) produce two or fewer stutterings per 100 words of conversational speech collected during videotaped interaction with their mothers (Conture & Kelly, in press; Louko, Edwards & Conture, 1990); and (2) people who knew them had expressed NO concerns regarding their speech fluency and/or NO beliefs that these children stuttered or would become stutterers (Conture & Kelly, in press; Louko, Edwards & Conture, 1990; Zebrowski & Conture, 1989). The mean frequency of stutterings (i.e., within-word dysfluencies) produced by the normally fluent subjects was 0.8 stutterings per 100 words of conversational speech (SD = 0.7) with a range of 0 to 2 stutterings per 100 words.

These normally fluent youngsters' frequency of within-word dysfluencies are consistent with those reported elsewhere for normally fluent children (e.g., Johnson et al., 1959; Yairi & Lewis, 1984).

Data Collection:

Audio-video taping. Each child was audio-videotaped in one recording session lasting approximately 30 to 35 minutes, while informally interacting with his mother. Each mother and child were seated face-to-face across from each other at a small table, upon which a Fisher-Price space station and related toys and figurines were placed. Use of such materials has been shown to be an effective means for obtaining samples of spontaneous, conversational speech from young children (Miller, 1981). Identical materials were used in an attempt to elicit a comparable sample of conversational speech from each child, so that samples would consist of relatively similar vocabulary and content theme. Mothers and children were instructed to talk and play "as they would at home."

Each mother-child pair was audio/video recorded for approximately 30 to 35 minutes, or until a sufficient sample was obtained from the child (at least 300 intelligible English words following the 10:00:00 mark of recording). Two stationary color video cameras (Panasonic Model WV-3250, and JVC Model BY-10U), mounted on a pan-tilt, fluid-head tripod, and placed at a constant distance (1 m) from the child and mother, permitted the experimenter to "centralize" the child's and mother's image as they moved around relatively freely in their chairs. The recorded images provided a clear, adequately illuminated view of the mother and child's head, arms and torso from the waist up. Each camera was equipped with a zoom lens that allowed the camera operator to adjust the video image of both mother and child so that both appeared to have an equal head size throughout recording. The child and mother were told to remain seated throughout the recording and both were directed back into their chair if either stood up, ducked under the table or otherwise moved out of full view of the camera.

The output of both cameras was channeled to a video switcher (Panasonic Model WJ-3500), which created a multi-plexed or split-screen composite image, so that the child's image occupied the left-, and the mother's image, the right-half of the screen of a television monitor. The output of a time edit code generator (Evertz, Model 3600D) was fed through the same video switcher, and the visually-apparent time code (minutes:seconds:videoframes), which was employed for subsequent data analysis, was time-locked to the videotape recordings of the mother-child interaction and visually displayed on the upper central portion of the television screen image (see Conture & Kelly, in press; Schwartz & Conture, 1988 for further details pertaining to these methods). The video split-screen composite for each mother-child dyad was recorded on a hi-fi, 13 mm Panasonic videocassette recorder-reproducer (VCR) (Model AG-1900), which simultaneously recorded the video signal at 30 frames per s (60 videofields per s), along with the associated acoustic signals from mother and child.

The subjects' associated audio signals were obtained using two wireless FM transmitter (Samson, Model CRX-3) -microphone (Samson, Model BT-3) units with retrofitted lapel microphone attachments (Sony, ECM-Model 55). Each lapel microphone was placed within 15 cm of both the mother's and the child's lips, fed to separate audio channels, and monitored throughout recording on separate VU meters located on the front of the Panasonic VCR. The video composite (the split-screen child's image plus mother's image and the visually-apparent time code) were monitored by two camera operators throughout recording. Each of these two camera operators viewed one of two video monitors (Sony, Trinitron) which displayed the video output of the VCR (i.e., split-screen composite of mother-child interaction).

Neutral-toned cloth backdrops were placed behind both the child and the mother to reduce visual distraction and provide a consistent background for maximum clarity and contrast of the recorded video images. Two Lowel 1000-watt studio lights were positioned, facing the taping area from opposite sides, to provide adequate illumination of the mother-child video images during recording.

Assessment of videotaped recordings. A repeated review of each subject's audio-videotape recording was conducted, employing a Panasonic video editing unit (Model AG-A750), and using the visually apparent time code which allowed investigators to view -- from stop motion to real time -- each 33.33 ms segment of the recorded sample (30 frames per s). The audio-videotaped recordings of each of the 20 children were assessed, focusing on the middle ten minutes of the 30-min mother-child conversation. The middle third of the 30-min taped session (minutes 10:00:00 through 20:00:00) was used if at all possible, because previous research (Zebrowski & Conture, 1989) has shown that during the first 10 minutes (00:00:00 - 10:00:00), the child and his/her mother may be adjusting to the novel environment, whereas during the last 10 minutes (20:00:00 - 30:00:00), the child may be more inattentive, fatigued or restless. There was no significant difference (t [df = 18] = 1.24; $p > 0.23$) between the total recording times needed to obtain a 300 intelligible word sample for the young stutterers (M =

13.6 minutes; SD = 9.1) and their normally fluent peers (M = 10.8; SD = 3.8).

Transcriptions and behavioral data analysis. An orthographic transcription of a 300-word sample of intelligible words produced by each of the 20 children was obtained. Simultaneously with the orthographic transcription, identification of the presence and onset of all within-word types of dysfluencies (stutterings), and verification of the child's talker group membership took place. Details pertaining to analytical procedures for identifying instances of stutterings, their onset and offset (i.e., duration) have been reported elsewhere (Conture & Kelly, in press; Schwartz & Conture, 1988; and Schwartz, Zebrowski, & Conture, 1990). In brief, sound/syllable repetitions, monosyllabic whole-word repetitions, within-word pauses and (in)audible sound prolongations were coded as stuttered, and the onset and offset of each instance of stuttering was located -- as precisely as possible within 33.33 ms (or 1 videoframe) of onset/offset time -- using the aforementioned video editing unit.

Selection of units of analysis. In the literature on gaze and mutual gaze, very little information apparently exists regarding the precise association between gaze behavior and relatively small units of spoken language, for example, the word. Condon and Ogston (1971) provide the only apparently available information relating specific ocular behaviors to spoken words, and they report more speaker eyeblinks occurring at the beginning as opposed to the end of the speaker's word. Some information exists regarding larger units of analysis (e.g., phrases; utterances; speaking versus listening conversational turns) and their association with changes in gaze, for example, an adult who is speaking will look less often than an adult who is listening (Argyle & Cook, 1976). However, the precise relation of these larger units of language to stuttering is not as well understood.

In contrast, in the literature on stuttering, there is a good deal known about the association between stuttering behavior and the form and function of spoken words (e.g., Brown, 1945; Williams, Silverman & Kools, 1969). Thus, for the present study, individual stuttered fluent and fluent words were chosen as the units of analysis. In order to more closely match the young stutterers' stutterings with fluent words produced by the normally fluent children, the investigator employed procedures developed by Schwartz and Conture (1988).

For the ten young stutterers, a random selection of 10 stuttered words per subject was obtained from each child's 300-word conversational sample. After these 10 stuttered words had been randomly selected from each stutterer, each word was assigned a "word weight" (from a minimum = 0 to a maximum = 4), using Brown's (1945) four "word weighting" factors: Grammatical Function, Sentence Position, Initial Consonant, and Word Length.[3] Next, for the ten young stutterers, 100 fluent words (10 words per subject) were selected from each child's speech samples, matched using Brown's word weights to their 100 stuttered words. The perceptibly fluent words had to be 2 or more words in distance from a stuttered word, and this criterion (which applied to both young stutterers and their normally fluent peers) was an attempt to minimize the influence of the "spread" or clustering of stuttering (Hubbard & Yairi, 1988) on results pertaining to the fluent words.

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[3] Williams, Silverman and Kools (1969) reported that these four "weighting factors" were highly associated with the stutterings of most elementary school-age stutterers, and Brown's original findings were based on adult stutterers' oral reading rather than conversational speech. Because children in this study conversed and were essentially non-readers, it seemed appropriate to slightly adapt one of these four factors -- word length in orthographic letters -- to be word length measured in phonemes.

Then, for the ten normally fluent speakers, ten fluent words per subject were matched -- in terms of the aforementioned word weights -- to the 10 (always comparable, sometimes identical) randomly selected stuttered words produced by each sex and age-matched (+/-4 months) stuttering child. Also, all (N = 22) within-word dysfluencies (i.e., stutterings) produced within the ten normally fluent children's 300-word transcripts were identified for subsequent analysis. Only 9 of the 10 normally fluent children produced any stutterings. To permit comparisons between stuttered and fluent words within the normally fluent talker group, the same number (N = 22) of fluent words, from the same 9 normally fluent children, were matched via Brown's word weights to the sample of their stuttered words.

Finally, to permit between-group comparisons in terms of stuttering, a like number (N = 22) of the young stutterers' stutterings were matched to the normally fluent peers' stutterings. For each of the stuttered and fluent words for the young stutterer and for the normally fluent child, the first author independently examined, on a videoframe-by-videoframe basis, first the child's and then the mother's ocular and head behaviors.

Five categories of mother/child gaze behavior. The single or multiple occurrences of each of the following five gaze categories were assessed during each of the 10 words per child (200 total observations for both talker groups):

(1) Eye contact: Both the mother's eyeballs and the child's eyeballs are perceived by the first author as being oriented toward each other's face.

(2) Mother-only gaze: The mother's eyeballs are perceived by the first author as being oriented towards the child's face, but the child's eyeballs are perceived as not being oriented towards the mother's face.

(3) Child-only gaze: The child's eyeballs are perceived by the first author as being oriented towards the mother's face, but the mother's eyeballs are perceived by the first author as not being oriented towards the child's face.
(4) Neither gaze: Neither the mother nor the child are perceived by the first author as orienting their eyeballs toward each other's faces.
(5) Questionable gaze: Either (a) the quality of the videotaped image was degraded or the image of the mother and/or child was obfuscated in some way, or (b) it was difficult or impossible for the first author to perceive the type of mother and/or child gaze behavior.

At least one of these five categories of gaze behavior was coded per each stuttered or fluent word (range = 1 to 4 categories coded per word for all 20 subjects). The mean percent of word duration occupied by each of these five gaze categories was computed for the ten stuttered words for each of the ten stuttering children/mothers and for the ten fluent words for each of the ten normally fluent children/mothers.

Specific ocular or ocular-related behaviors (ORBs) associated with mother/child gaze behavior. Twenty ocular-related behaviors were assessed for each of the stuttered and fluent words produced. The 20 ORBs and their associated code numbers (e.g., #5 for Upper Lid Raise), selected from the Facial Action Coding System (FACS; Ekman & Friesen, 1978), are categorized below into three subtypes -- eyelid actions, eyeball positions, and head positions:

(1) Eight Eyelid "Action Units (AUs)," (AUs #5 Upper Lid Raise, #7 Lid Tightener, #41 Lid Droop, #42 Slit, #43 Eyes Closed, #44 Squint, #45 Blink, #46 Wink). An action unit relates to a specific muscular movement(s) "...responsible for momentary changes in facial appearance" (Ekman & Friesen, 1978, p. 1);
(2) Four "Eye position" behaviors (positions #61-64, i.e., Eyes Left, Right, Up, Down) and
(3) Eight Head positions (positions #51-58, i.e., Head Left, Right, Up, Down, Tilt Left, Tilt Right, Forward, Back).

These, as well as other, FACS behaviors have been shown to be (e.g., Wiggers, 1982) the minimal units of facial behavior that are anatomically separate, visually distinguishable, and can be described without reference to the subject's intention.

In addition to the above 20 ORBs, FACS permits scoring of "neutral" (Code #0) action units, defined, for the purposes of this study, as "...no detectable action" (Ekman & Friesen, 1978, p.10-3) of eyelid, head, eyeball movements, as well as any hand or torso movement that acted to make or break eye contact or individual gaze (i.e., no discernible ORBs). FACS also permits the investigator to code as non-observable or "not visible" the following: brows (#70), eyes (#71), lower face (#72), half face (#73), and entire face or head (#75). Appendix I contains the criteria for coding each of the 20 FACS positions/action units involving the eyes and head, behaviors which will be termed "ocular-related behaviors" ("ORBs"), as well as the criteria for coding neutral and not visible behaviors.

Intra- and interjudge measurement reliability. Twenty words, that is, ten stuttered words (one word randomly selected from five of the ten mother-young stutterer pairs and one word randomly selected from five of the 9 mother-normally fluent child pairs where stuttering occurred), and ten fluent words (one word randomly selected from five of the ten mother-young stutterer pairs and one word randomly selected from five of the ten mother-normally fluent child pairs) were re-assessed to determine intrajudge and interjudge measurement reliability for various aspects of stuttering, gaze categories, and type of ocular/head behavior. Intrajudge (first author) and interjudge (first versus second author) measurement agreement indexes (i.e., agreements divided by agreements plus disagreements, multiplied by 100) for the aforementioned 20 randomly selected samples indicated the following intrajudge/interjudge agreements:

Number of stutterings: 94% / 86%
Type of stutterings (e.g., sound-syllable repetition versus whole-word repetition): 91% / 91%
Number of gaze categories between child and mother: 100% / 92%
Type of gaze between child and mother: 90% / 88%
Number of ocular/head or related behavior of child: 90% / 94%
Type of ocular/head or related behavior of child: 78% / 80%
Number of ocular/head or related behavior of mother: 94% / 73%
Type of ocular/head or related behavior of mother: 88% / 78%

Because duration is a continuous rather than categorical measure, measurement reliability scores for duration are expressed in mean difference scores rather than percent of agreement indices. Thus, mean interjudge measurement error for duration of (dys)fluent word was plus or minus 5.4 videoframes, or 180 ms (range = 0 to 13 videoframes or 0 to 433 ms), and intrajudge measurement error for same was plus or minus 6.1 videoframes, or 203 ms (range = 2 to 20 videoframes or 67 to 667 ms).

Data Analysis: Central tendencies and dispersion of proportions of the five categories of gaze behavior (eye contact, mother-only gaze, child-only gaze, neither gaze, and questionable) as well as frequency, type, and duration of eyeball and head positions and of eyelid Action Units (i.e., ocular/head behavior) occurring between (non)stuttering children and their mothers, were descriptively as well as statistically analyzed. All percentage values for each of the five gaze types per child were arcsine transformed before application of inferential statistical tests.

A series of Mann-Whitney U tests (e.g., Siegel, 1956) were performed, using an alpha-adjusted or Bonferroni inequality procedure whereby the overall or simultaneous error rate was set at $p = 0.05$, in order to make mean difference comparisons of the following: (1) percentage of word duration for each of the four non-questionable gaze behaviors (i.e., eye contact, mother-only gaze, child-only gaze, neither gaze); and (2) frequencies of nonspeech behaviors (i.e., eyeball, eyelid, and head FACS action units, plus neutral and not visible behaviors) per stuttered word production. Between-group comparisons employed Mann-Whitney U tests, while within-comparisons involved the use of Wilcoxon Matched Pairs Signed Ranks Test (T). These nonparametric methods were employed because the dependent variables often lacked a normal (Gaussian) distribution, were less than an interval level of measurement (i.e., percent of word duration each gaze occupied), and sometimes involved relatively small sample sizes (e.g., 22 stutterings were produced by normally fluent children).

RESULTS

Relationship between duration of fluent or stuttered word and occurrence of gaze behavior. For young stutterers and their mothers during stuttered words, no significant relationship (correlations and associated p-values ranging from $r = 0.14$; $p = 0.15$ for Mother-only gaze to $r = -0.07$; $p = 0.52$ for Child-only gaze) was found between stuttering duration (M = 1319 ms; SD = 866 ms) and occurrence of any of the 4 non-questionable gaze categories. Also, for young stutterers and their mothers during fluent words, no significant relationship ($r = 0.06$; $p = 0.57$ for Neither gaze, ranging to $r = -0.01$; $p = 0.92$ for Eye contact) was found between duration of fluent words (M = 345 ms; SD = 204 ms) and occurrence of any of the 4 non-questionable gaze categories.

For young normally fluent children and their mothers during stuttered words, no significant relationship was found between duration of stuttering (_M_ = 1133 ms; _SD_ = 423 ms) and occurrence of any of the 4 non-questionable gaze categories. That is, correlations and associated p-values were as follows: $r = -0.32$; $p = 0.15$ for Mother-only gaze; $r = 0.32$; $p = 0.15$ for Neither; and Child-only and Eye contact gaze categories never occurred during these 22 stutterings produced by the normally fluent children. For normally fluent children and their mothers during fluent words, one significant positive relation was found between the mean length of fluent word productions (_M_ = 338 ms; _SD_ = 187 ms) and the occurrence of "child-only" gaze ($r = 0.35$; $p < 0.01$). However, the other 3 non-questionable gaze categories were not correlated with duration of their fluent words, with correlations and associated p-values ranging from $r = 0.10$; $p = 0.32$ for Eye contact, to $r = -0.04$; $p = 0.72$ for Mother-only gaze.

Relationship between location of fluent or stuttered word in turn-at-talk and gaze behavior. Goodwin (1980) states that whenever possible, speakers generally try to obtain the gaze of their listeners during their turn-at-talk. A child's speaking turn is often comprised of one utterance (Miller, 1981), and the majority (71%) of all words sampled in the present study were produced within a speaking turn, rather than at the beginning (29%) or at the end (0%) of a turn. Thus, it seems probable that any eye contact which occurred was not primarily the result of the need for speaker-listener turn exchange monitoring. Furthermore, Duncan (1975) has de-emphasized the function of gaze as a turn-taking cue by stating that "..it failed to differentiate smooth exchanges of the speaking turn from instances of simultaneous claiming of the turn by the two participants (Duncan, 1975, p. 206)."

Between-group comparison: Young stutterers' and their mothers' gaze behavior during stutterings versus normally fluent peers and their mothers' gaze behavior during fluency. Figure 1 illustrates the mean percent of word duration for each gaze category produced by the mothers and children of both talker groups. Mann-Whitney U tests were used to statistically assess between-group differences for the four non-questionable gaze categories (i.e., eye contact, mother-only gaze, child-only gaze, neither gaze), using an overall alpha level = 0.05 for the four comparisons as a family and comparing each of the four non-questionable categories with an individual probability (p-value) per test = 0.0125. Mother/child eye contact occurred significantly (Mann-Whitney U = 82; p = 0.01) more often during stuttering in the stuttering child-mother dyads (M = 10.6; SD = 16.4) than during the fluent words in the normally fluent peer-mother dyads (M = 2.0; SD = 4.3). Both the normally fluent children and their mothers did not gaze at one another (i.e., the "Neither" gaze category) (M = 68.4; SD = 21.2) significantly more often (U = 16; p = 0.01) than did young stutterers and their mothers (M = 37.5; SD = 24.6).

FIGURE 1 ABOUT HERE

Mothers of young stutterers gazed at their stuttering sons appreciably but not significantly (U = 77; p = 0.04) more frequently (M = 48.5; SD = 23.0) than did mothers of normally fluent children (M = 25.5; SD = 20.3). There were no significant differences (U = 61; p = 0.35) between the child-only gaze produced by stuttering children (M = 1.1; SD = 1.9) and that produced by normally fluent children (M = 0.4; SD = 0.8).

Between talker group comparison: Gaze behavior during stuttering. Figure 2 illustrates the mean percent of word duration for each gaze category that mothers and children in each talker group spent producing during the 22 comparable stuttered words produced by each talker group. The mean duration of normally fluent children's 22 stutterings was 1132 ms (SD = 422 ms), and the mean duration of 22 comparable stutterings of the young stutterers was 1390 ms (SD = 688 ms), a difference which was not significant ($U = 49.5$; $p = 0.43$). During stuttering, no significant differences (overall alpha = 0.05; individual probability level per test = 0.0125) were found between talker groups for any of the non-questionable gaze categories, with Mann-Whitney U test probabilities ranging from $p = 0.15$ to $p = 0.31$.

FIGURE 2 ABOUT HERE

Between talker group comparison: Gaze behavior during fluency. Figure 3 illustrates the mean percent of word duration of each gaze category that mothers and children in each talker group spent producing during the 100 comparable fluent words produced by each talker group. During fluency, no significant differences (overall alpha = 0.05; individual probability level per test = 0.0125) were found between talker groups in terms of gaze behavior, with Mann-Whitney U test probabilities ranging from $p = 0.13$ to $p = 0.68$.

FIGURE 3 ABOUT HERE

Within-Group Comparison: Young stutterers' gaze behavior during fluent versus stuttered words. Figure 4 illustrates the mean percent of word duration for each gaze category that mothers and stuttering children spent producing during the 100 stuttered versus comparable fluent words.

FIGURE 4 ABOUT HERE

Using Wilcoxon Matched Pair signed ranks tests (T) to assess these within-group differences, no significant differences (overall alpha = 0.05; individual probability level per test = 0.0125) were found between fluent and stuttered words in terms of the four non-questionable gaze behavior stutterers and their mothers produced. However, the situation in which neither young stutterers nor their mothers gazed at one another occurred substantially -- but not significantly ($T = 1.9$; $N = 10$; $p = 0.05$) -- more frequently during fluent ($M = 52.7$; $SD = 14.8$) than during stuttered words ($M = 37.5$; $SD = 24.6$).

Normally fluent children's gaze behavior during fluent versus stuttered words. Figure 5 illustrates the mean percent of word duration for each gaze category that mothers and stuttering children spent producing during the 22 stuttered versus comparable 22 fluent words. Using Wilcoxon Matched Pair signed ranks (T) to assess these within-group differences (overall

FIGURE 5 ABOUT HERE

to assess these within-group differences, no significant differences (overall alpha = 0.05; individual probability level per test = 0.0125) were found between fluent and stuttered words in terms of the gaze behavior that normally fluent children and their mothers produced, with Wilcoxon probabilities ranging from $p = 0.32$ to $p = 1.00$ (for Child-Only gaze, which never occurred during normally fluent youngsters' stuttered or fluent words).

Number and nature of ocular-related behaviors (ORBs), neutral and nonvisible behavior associated with gaze categories occurring during stuttered and fluent words. Table 2 shows the total number of ORBs, neutral, and not visible behaviors during stuttered and fluent words for children and mothers of the two talker groups. Mann-Whitney U tests were used to statistically assess differences between talker groups for the six nonspeech behavior categories, that is, number of ORBs per child and mother, number of neutral behaviors per child and mother, and number of nonvisible behaviors per child and mother. An overall alpha level = 0.05 was used for the six comparisons as a family, and each of the six categories was compared with an individual probability (p-value) per test = 0.008.

Between-group comparisons. Young stutterers were found to produce significantly (Mann-Whitney $\underline{U} = 91.5$; $\underline{p} = 0.002$) more ORBs during their stuttered words ($\underline{M} = 1.40$; $\underline{SD} = 0.51$) than did normally fluent children during comparable fluent words ($\underline{M} = 0.61$; $\underline{SD} = 0.22$). Similarly, mothers of stutterers produced significantly (Mann-Whitney $\underline{U} = 94.5$; $\underline{p} = 0.001$) more ORBs during their children's stutterings ($\underline{M} = 1.51$; $\underline{SD} = 1.06$) than mothers of the normally fluent youngsters produced ($\underline{M} = 0.54$; $\underline{SD} = 0.22$). Normally fluent children exhibited significantly ($\underline{U} = 5.0$; $\underline{p} = 0.001$) more neutral behaviors ($\underline{M} = 0.41$; $\underline{SD} = 0.19$) during their fluency than did young stutterers ($\underline{M} = 0.11$; $\underline{SD} = 0.09$) during their stuttering. Likewise, during their children's fluency, mothers of normally fluent children showed significantly ($\underline{U} = 12.0$; $\underline{p} = 0.003$) more neutral behaviors ($\underline{M} = 0.49$; $\underline{SD} = 0.16$) than did mothers of stutterers ($\underline{M} = 0.27$; $\underline{SD} = 0.13$) during their children's stuttering. Finally, young stutterers exhibited significantly ($\underline{U} = 90.5$; $\underline{p} = 0.002$) more nonvisible behaviors ($\underline{M} = 0.35$; $\underline{SD} = 0.20$) during their stuttering than their normally fluent peers did ($\underline{M} = 0.08$; $\underline{SD} = 0.06$) during their fluency, although the difference between the two mother groups in terms of their nonvisible behaviors was not significant ($U = 61.5$; $p = 0.338$).

During stuttering, no significant differences were found between normally fluent children and young stutterers in the number of the children's or their mother's ORBs, neutral, or nonvisible behaviors. Young stutterers' nonvisible behaviors ($M = 0.27$; $SD = 0.36$) approached but were not significantly ($U = 58.5$; $p = 0.03$) greater than those nonvisible behaviors of their normally fluent peers, who produced *no* nonvisibles ($M = 0.0$; $SD = 0.0$).

During fluency, normally fluent children exhibited appreciably but *not* significantly ($U = 23.5$; $p = 0.04$) more ORBs ($M = 0.61$; $SD = 0.22$) than did young stutterers during matched fluent words ($M = 0.41$; $SD = 0.14$). Similarly, mothers of young stutterers exhibited appreciably but not significantly ($U = 28$; $p = 0.09$) more ORBs ($M = 0.54$; $SD = 0.22$) than did mothers of stutterers ($M = 0.38$; $SD = 0.18$). In contrast, young stutterers during fluency displayed appreciably but not significantly ($U = 74$; $p = 0.06$) more neutral behaviors ($M = 0.53$; $SD = 0.13$) than their normally fluent peers produced ($M = 0.41$; $SD = 0.19$). Similarly, mothers of young stutterers during their children's fluency, also showed appreciably but not significantly ($U = 74.5$; $p = 0.06$) more neutral behaviors ($M = 0.63$; $SD = 0.18$) than did mothers of normally fluent children ($M = 0.49$; $SD = 0.16$).

Within-group comparisons. Using Wilcoxon Matched Pair signed ranks tests (T) (overall alpha level = 0.05; individual probability level per test = 0.008), it was found that, during stutterings, young stutterers produced significantly ($T = 2.8$; $N = 10$; $p = 0.005$) more ORBs during stuttered ($M = 1.40$; $SD = 0.51$) than during their comparable fluent words ($M = 0.43$; $SD = 0.17$). Similarly, their mothers produced significantly ($T = 2.8$; $N = 10$; $p = 0.005$)

more ORBs during their children's stutterings (M = 1.51; SD = 1.06) than during comparable fluencies (M = 0.38; SD = 0.19). Conversely, during fluency, young stutterers displayed significantly (T = -2.8; N = 10; p = 0.005) more neutral behaviors (M = 0.52; SD = 0.13) than during their stuttering (M = 0.11; SD = 0.09), and their mothers also showed significantly (T = -2.8; N = 10; p = 0.005) more neutral behaviors during their children's fluency (M = 0.65; SD = 0.16) than during stuttering (M = 0.27; SD = 0.13). Young stutterers exhibited appreciably but not significantly (T = 2.5; N = 10; p = 0.01) more nonvisible behaviors during stuttering (M = 0.35; SD = 0.20) than they did during fluency (M = 0.08; SD = 0.11). Mothers of stutterers, as well, displayed appreciably but nonsignificantly (T = 1.8; N = 10; p = 0.07) more nonvisible behaviors during stuttering (M = 0.12; SD = 0.15) than during fluency (M = 0.01; SD = 0.03).

Finally, during stuttering, the normally fluent children produced appreciably but not significantly (T = 2.4; N = 9; p = 0.02) more ORBs (M = 0.78; SD = 0.49), than they did during comparable fluent words (M = 0.23; SD = 0.39). Also, normally fluent children produced appreciably but not significantly (T = -2.2; N = 9; p = 0.03) more neutral behaviors (M = 0.77; SD = 0.39) during fluent words than they did during their stuttering (M – 0.30, SD = 0.34). No other within-group comparisons for the normally fluent children were significantly different in terms of ORBs.

DISCUSSION

Young stutterers' eye contact with their mothers. To our knowledge, this is the first study to directly assess eye contact between young stutterers (ages 3 to 6) and their mothers during instances of stuttered and fluent utterances in comparison to that exhibited between normally fluent peers and their mothers during comparable utterances. One of the major findings is that during stuttering, young stutterers engage in eye contact with their mothers significantly more often than normally fluent peers and their mothers do during comparable fluent words. Conture and Kelly (in press) suggest that a sample of nonspeech behavior of normally fluent children and their mothers during fluency can be used as a "touchstone" to compare and contrast findings regarding young stutterers and their mothers. Following this suggestion, and insofar as eye contact occurring between normally fluent children and their mothers can be considered "typical" or "natural," one might conclude, based on present findings, that young stutterers' and their mothers' relatively frequent eye contact during stuttering may actually be "atypical" or "unnatural," in contrast to that exhibited by normally fluent children and their mothers during fluency.

Comparisons to previous research. When compared to adults who stutter, the amount of eye contact shared between stuttering children and their mothers during stuttered words in this current investigation (11%) was considerably less than that between adult stutterers and a continually gazing confederate during words spoken in response to stimulus words read aloud by the confederate (47%), in the word association paradigm employed by Jensen et al. (1986). In the present study, during fluency, normally fluent peers and their mothers exhibited only 2%

eye contact during fluent words. When these normally fluent children stuttered, very little eye contact (0.3%) occurred, a finding considerably different than that of the nonstuttering adults (48%) producing (presumably) fluent words in Jensen et al.'s experiment. However, there are two notable differences between the present study and that of Jensen et al., besides that of children versus adults: (1) there was no report in the Jensen et al. study of how many of the stutterers' words were stuttered, and (2) Jensen et al.'s single-word list methodology was quite different from the natural conversational samples used in the present study.

The present finding of 2 percent eye contact between the ten 3;7 - 6;2 year-old normally fluent children and their mothers during fluency is appreciably less than Podrouzek and Furrow's (1988) report of 9 percent eye contact between 3;6 - 4;0 year old (presumed) typically speaking boys and their mothers during "utterances" produced during free-play interactions and conversations. Perhaps this difference is in part due to the fact that Podrouzek and Furrow used entire utterances as their unit of analysis, while the present study used the single word as the unit of analysis. If eye contact is going to occur, it probably has a higher likelihood of doing so in a phrase or sentence, which provides a longer temporal "window" or opportunity for eye contact to occur than does a word. Furthermore, if the present authors had used utterances containing stuttering rather than just the stuttered words themselves, young stutterers and their mothers might have been shown to exhibit even greater than 11 percent eye contact. However, whether such methodological variations influence findings is an issue which must await future empirical investigations.

Finally, the findings of Atkins' (1988) questionnaire study, which suggests that listener perceptions of adults with minimal eye contact can be equated with perceptions of adults who stutter, would seem much less applicable to children who stutter, because present findings show that young stutterers instead share more eye contact with their listening mothers when compared to that shared between normally fluent children and their mothers during fluency.

Perhaps one reason why eye contact frequently occurred between young stutterers and their mothers is that mothers of stutterers gazed at their non-gazing stuttering children for about half (M = 49%) of all stutterings (N = 100), whereas the mothers of normally fluent children only gazed toward their non-gazing children for about a quarter (M = 26%) of all fluent words (N = 100). Thus, young stutterers may simply have had a greater opportunity to participate in eye contact with their mothers than did the normally fluent children. Consistent with this possibility is the finding that neither the young stutterers nor their mothers gazed away from one another as much as did the normally fluent children and their mothers. Perhaps, the normally fluent children looked away more often because they were more interested in the toys in front of them or by their novel surroundings than were the stuttering children.

Because children in both talker groups rarely gazed at their mothers when their mothers were not gazing at them, mothers' individual gaze towards her child can be considered a major factor in whether or not eye contact is achieved. These findings fit with the adult conversational maintenance model of Goodwin (1980), who suggests that the responsibility for obtaining moments of eye contact at the beginning of utterances and elsewhere throughout the conversation lies with the listener, that is, in this study, with the mothers.

Present findings also support clinical intuition and observations that parents "who have been told not to lose eye contact stare fixedly at their [stuttering] child" (Starkweather, Gottwald, Halfond, 1990, p.21). In order to "give more eye contact" to their stuttering children, parents must necessarily look and then wait for these children to return or reciprocate the look. Indeed, one mother of a stutterer in the present study directly informed her stuttering son, "You know what? You look right at me when you talk to me, all right?" Based on such observations, it could be argued that rather than too little eye contact too much eye contact could also be considered inappropriate, because continually gazing toward the conversational partner may be just as atypical as continually turning or directing one's gaze away from the conversational partner. Either case -- continuously staring at or away from the speaker -- may serve to exacerbate or maintain young stutterers' stuttered speech behavior. In other words, too much eye contact, as Argyle & Dean (1965) have suggested, may exceed a certain "eye contact equilibrium."

Alternative explanations of eye contact between young stutterers and their mothers:

Needs to monitor and/or avoid; needs to inform and or to seek information.

Mothers of stutterers might look at their children when they are stuttering because they mothers feel, for reasons which are presently unknown, that they "ought" to more closely affiliate (i.e., unite, connect) with their stuttering child, perhaps even more so than do mothers of normally fluent children. Considering that mothers of stutterers are the conversational partners who seem to typically initiate eye contact (i.e., the mother looks first at her child, then her child looks), these mothers may be doing so in order to watch or visually monitor their stuttering children's (non)speech behaviors and/or reactions to instances of stuttering. However, it is unknown whether a mother of a young stutterer (1) looks to monitor, in order to better assess what her child is doing (non)vocally as he is stuttering and/or (2) looks to inform, that is, to provide her child with visual information which lets him know she is "listening" to him, even though he is struggling to "get the word out." It is also possible that, during instances of stuttering, the young stutterer himself may have increased needs to either look to monitor what his mother is doing as he stutters, and/or look to inform his mother that he is concerned about his (non)speech behavior, although evidence is not available from the present study to support or refute these speculations.

The fact that there were only 22 stutterings in the entire 3000 words of conversational speech from the 10 normally fluent children precludes definitive statements regarding between-talker group differences in eye contact during stuttering. With that caveat noted, however, it seems worthwhile to speculate about children's need to avoid versus their need to seek information. Rutter (1984) suggests that breaking eye contact, or "gaze aversion" reflects either: (1) attempts to avoid information overload, that is, looking away to shut out information to avoid distraction; or, (2) attempts to seek information, that is, looking away to see an object (e.g., toy) which is or will be the topic of conversation. Perhaps, a young stutterer lowers his eyelids and moves his eyeballs laterally in an effort to lessen some of the "cognitive load," and decrease sensory input. When a significant part of the sensory input is his mother's face, endogenous blinking (Stern, Walrath, & Goldstein, 1984), or, in this case, drooping eyelids plus moving eyeballs down, may serve as a means of reducing aversive listener feedback, one explanation previously put forth by Conture and Kelly (in press).

Mothers' attempt to regulate child's conversational behavior. Perhaps a mother of a young stutterer frequently looks up or over at her child's face immediately after her child begins stuttering, because she wants, at some level, to regulate the conversation by speaking for him. She may think about doing this even though she may know she should not and may not actually do so. The present investigators informally observed that mothers of stutterers frequently seem to silently articulate the same sounds or syllables their child was stuttering on, although mothers of normally fluent children sometimes do this as well. Perhaps a young stuttering child reciprocates mother-only (individual) gaze directed towards him and thus makes eye contact because he is signalling to her that he needs "assistance," that he needs his mother to help regulate his "out-of-control" speech.

Some caveats. First, the possibility exists that instances of stutterings contain more nonspeech behaviors and more gaze behavior merely because they last longer than do fluent words. In the present study, percent of word duration rather than absolute numbers of behaviors per word were used to compare the two talker groups, and only one significant positive relation was found between the mean length of the analyzed word and gaze category (i.e., between normally fluent children's fluent word productions and the percentage of their "child-only" gaze). Nevertheless, the relation of amount and nature of eye contact and length of analyzed unit of speech needs further investigation, given the fact that this is the first and only known study in this area.

Secondly, morphologic, phonologic, syntactic, and pragmatic (i.e., linguistic) factors were not the focus of the present study, but they probably had some as yet unknown influence on present findings. For example, if, during conversations, mothers of young stutterers asked more questions of their children than did mothers of normally fluent children, as some have found (Langlois, Hanrahan, & Inouye, 1986), then this conversational difference may somehow influence the amount of eye contact observed between young stutterers and their mothers. In future research it may be helpful to either tell parents of stutterers directly that they "need not do anything special to get [your] child to speak," as Podrouzek and Furrow (1987) did when carrying out their experiment, or perhaps only assess stutterings in utterances where children are not responding to their mothers' questions. At present, not much objective information is available regarding the relationship of these various linguistic (e.g., pragmatic) variables and the nonspeech behaviors of mothers of stutterers.

Thirdly, obtaining information about normally fluent children's and their mothers' gaze behaviors during stuttered word productions and making reasonable comparisons to the stutterings of young stutterers is no small problem. For example, in this study, within 3000 total words of conversational speech, 9 of the 10 normally fluent subjects produced a total of only 22 within-word disfluencies, as opposed to the 10 young stutterers who produced a total of 361 within-word disfluencies during their 3000 words of conversational speech. Methodological procedures will be needed to adjust for these large inequities in stuttering frequency between the two talker groups, a problem inextricably related to classifying someone as a stutterer in terms of stuttering frequency.

Concluding remarks. Findings are taken to suggest that children who stutter, rather than exhibiting less than typical amounts of eye contact with their listeners as adult stutterers supposedly do, instead exhibit more than typical amounts of eye contact with their listening mothers. It also appears that mothers of stutterers are usually the ones to initiate eye contact during stuttering because, for the young stutterer-mother dyads, and to a lesser degree for the normally fluent children-mother dyads, when neither mother nor child gazed at each other, it was usually followed by the mother gazing at her non-gazing child. Further study of eye contact and related nonspeech behaviors produced by young stutterers and their conversational partners should increase our understanding of speech-related variables that may exacerbate or maintain stuttering in young children.

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FIGURE LEGENDS:

FIGURE 1: Between-talker group comparison of 100 stuttered words in young stutterer group and 100 comparable fluent words in normally fluent peer group. Mean and standard error (vertical brackets) of mean percent of word duration for each of five gaze categories: (1) Child-only (CH), (2) Questionable (QU), (3) Eye contact (EC), (4) Neither (NT), and (5) Mother-only, displayed by children and mothers of each talker group. White bars indicate the gazes occurring between the 10 young stutterers and their mothers during the young stutterers' stuttered words (ST_STUT) (N = 100). Black bars indicate the gazes occurring between the 10 normally fluent children and their mothers during these normally fluent children's fluent words (NF_FLNT) (N = 100). Eye contact (EC) occurred significantly (Mann-Whitney U = 82; p = 0.01) more often during stutterers' stuttering (M = 10.6; SD = 16.4) than during normally fluent peers' fluency (M = 2.0; SD = 4.3), and the category wherein neither (NT) gazed occurred significantly (U = 16; p = 0.01) more often during normally fluent peers' fluency (M = 68.4; SD = 21.2) than during young stutterers' stutterings (M = 37.5; SD = 24.6).

FIGURE 2: Between-talker group comparison of 22 stuttered words per talker group. Mean and standard error (vertical brackets) of mean percent of word duration for each of five gaze categories: (1) Child-only (CH), (2) Questionable (QU), (3) Eye contact (EC), (4) Neither (NT), and (5) Mother-only (MO). White bars indicate the gazes occurring between the 10 young stutterers and their mothers during the young stutterers' stuttered words (ST_STUT) (N = 22). Black bars indicate the gazes occurring between the 9 normally fluent children and their mothers during these normally fluent children's stuttered words (NF_STUT) (N = 22). No significant differences were found between talker groups.

FIGURE 3: Between talker group comparison of 100 fluent words per group. Mean and standard error (vertical brackets) of mean percent of word duration for each of five gaze categories: (1) Child-only (CH), (2) Questionable (QU), (3) Eye contact (EC), (4) Neither (NT), and (5) Mother-only (MO). White bars indicate the gazes occurring between the 10 young stutterers and their mothers during the young stutterers' fluent words (ST_FLNT) (N = 100). Black bars indicate the gazes occurring between the 10 normally fluent children and their mothers during these normally fluent children's fluent words (NF_STUT) (N = 100). No significant differences were found between the talker groups.

FIGURE 4: Within the talker group of young stutterers: Comparison of their 100 stuttered words versus their 100 comparable fluent words. Mean and standard error (vertical brackets) of mean percent of word duration for each of five gaze categories: (1) Child-only (CH), (2) Questionable (QU), (3) Eye contact (EC), (4) Neither (NT), and (5) Mother-only (MO). White bars indicate the gazes occurring between the 10 young stutterers and their mothers during the young stutterers' stuttered words (ST_STUT) (N = 100). Black bars indicate the gazes occurring between these same young stutterers and their mothers during the stutterers' fluent words (NF_FLNT) (N = 100). No significant differences were found between young stutterers' stuttered and fluent words. However, one difference approached but did not reach significance when Wilcoxon matched pairs signed ranks tests were used (T = 1.9; N = 10; p = 0.05). This appreciable difference was found in the Neither (NT) category between the fluent and stuttered words, meaning that the situation in which neither young stutterers nor their mothers gazed at one another occurred more during fluent words (M = 52.7; SD = 14.8) than during stuttered words (M = 37.5; SD = 24.6).

FIGURE 5: Within the talker group of normally fluent speakers: Comparison of their 22 stuttered words versus 22 comparable fluent words. Mean and standard error (vertical brackets) of mean percent of word duration for each of five gaze categories: (1) Child-only (CH), (2) Questionable (QU), (3) Eye contact (EC), (4) Neither (NT), and (5) Mother-only (MO). White bars indicate the gazes occurring between the 9 normally fluent children and their mothers during the normally fluent speakers' stuttered words (NF_STUT) (N = 22). Black bars indicate the gazes occurring between these same normally fluent children and their mothers during their fluent words (NF_FLNT) (N = 22). No significant differences were found between normally fluent speakers' stuttered and fluent words.

FIGURE 1

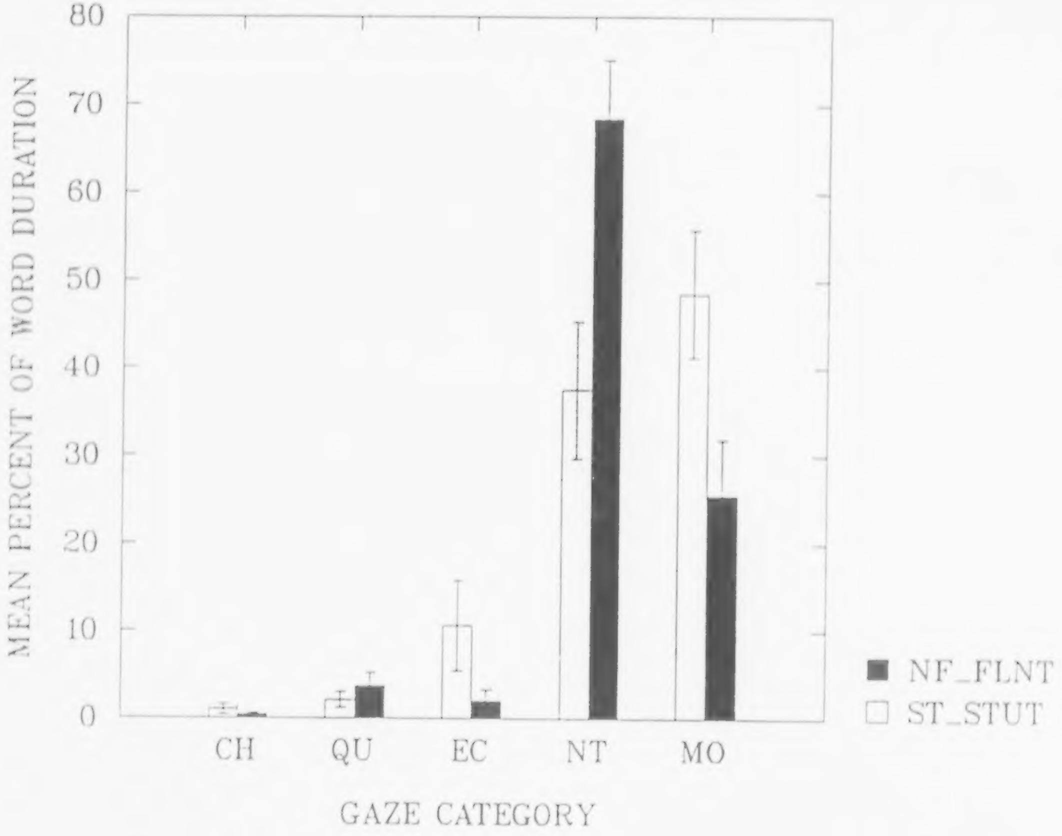
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FIGURE 2

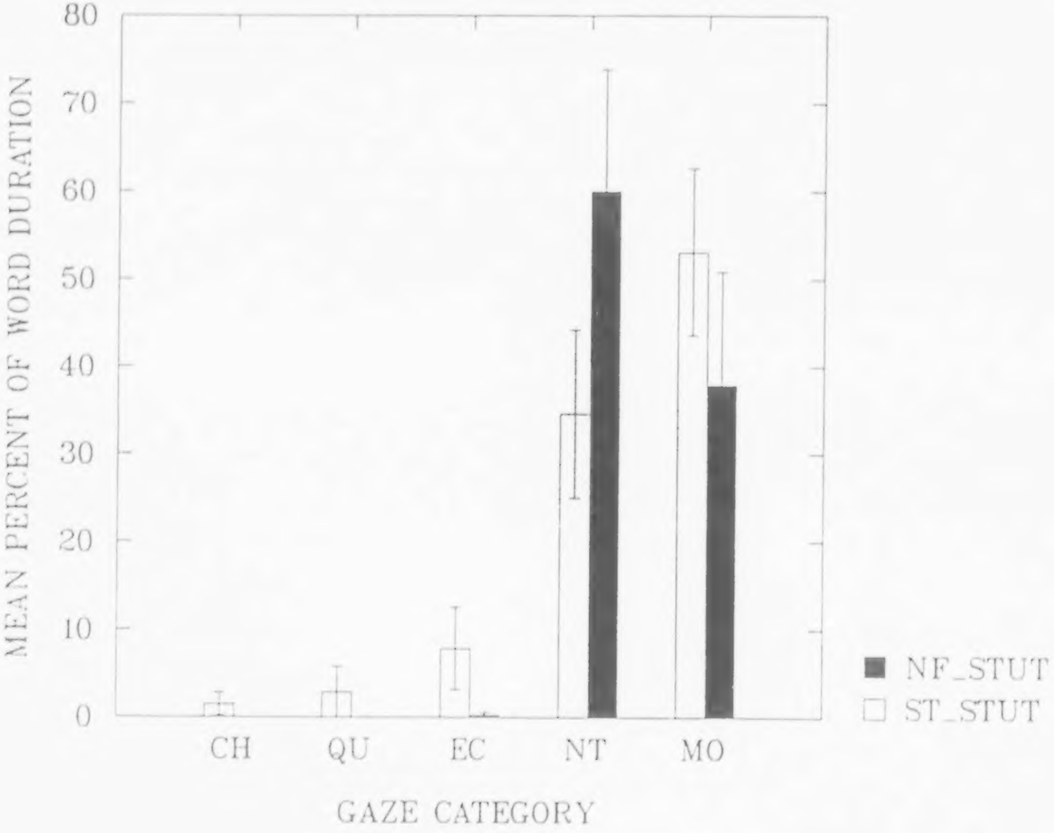
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FIGURE 3

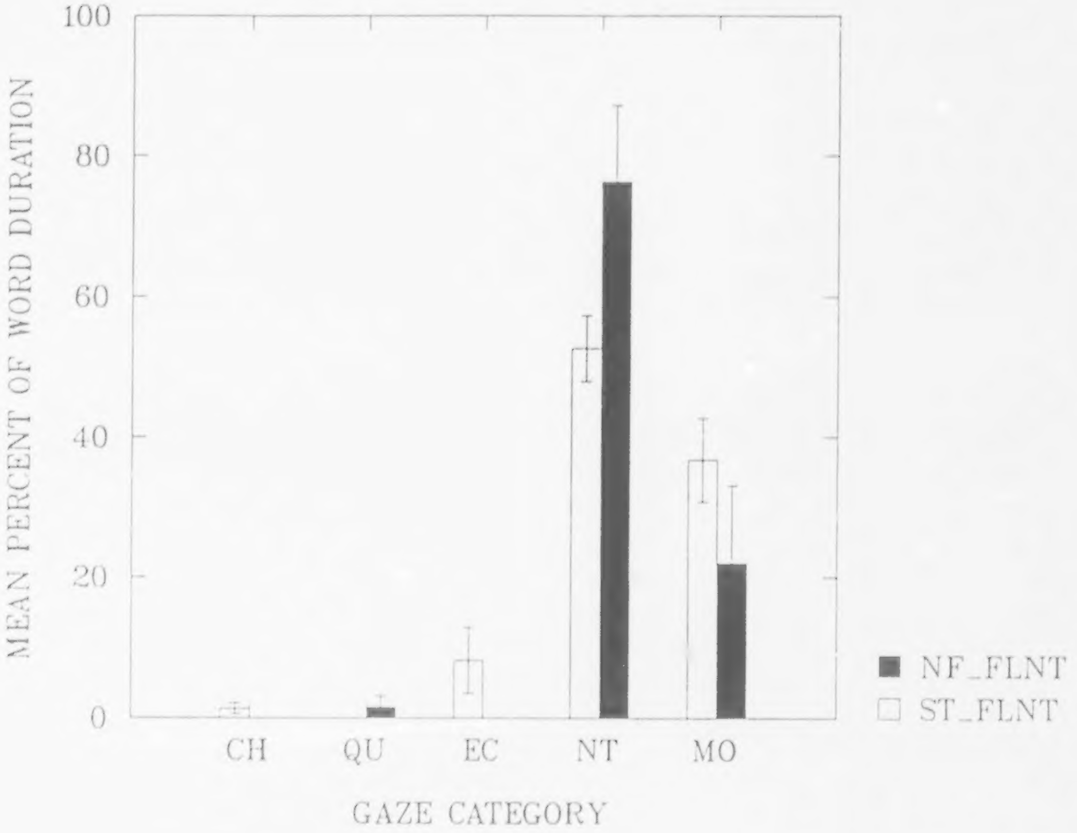

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FIGURE 4

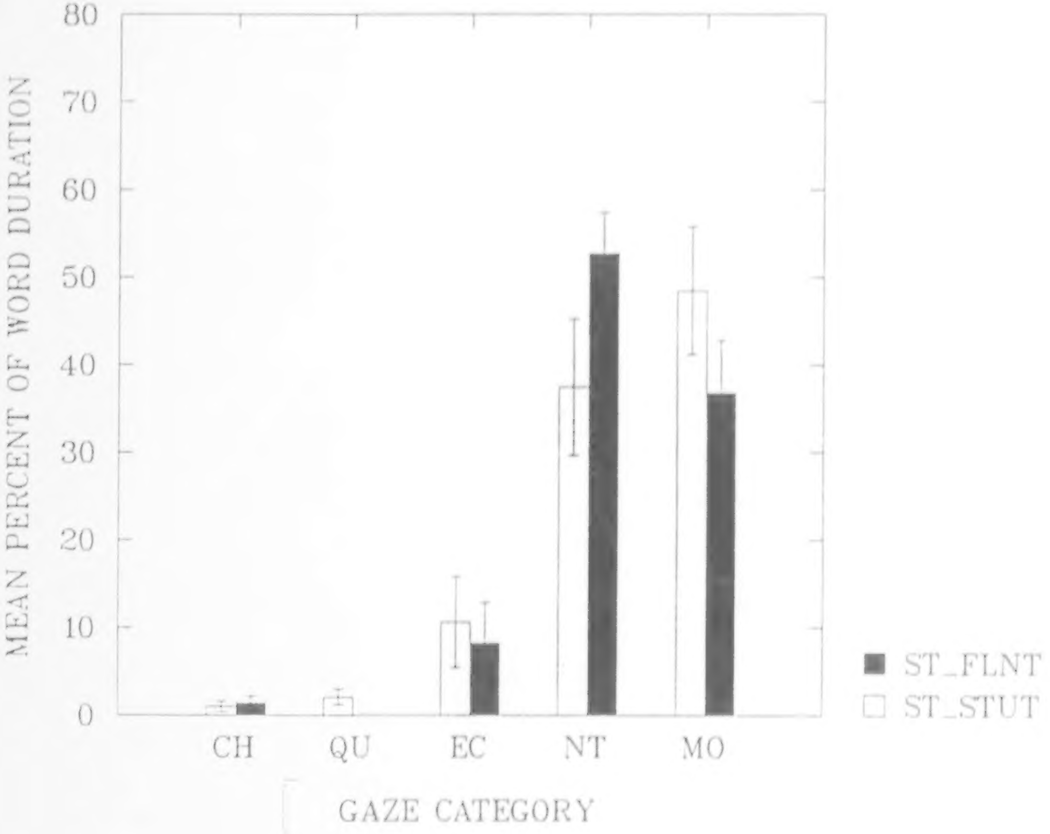

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FIGURE 5

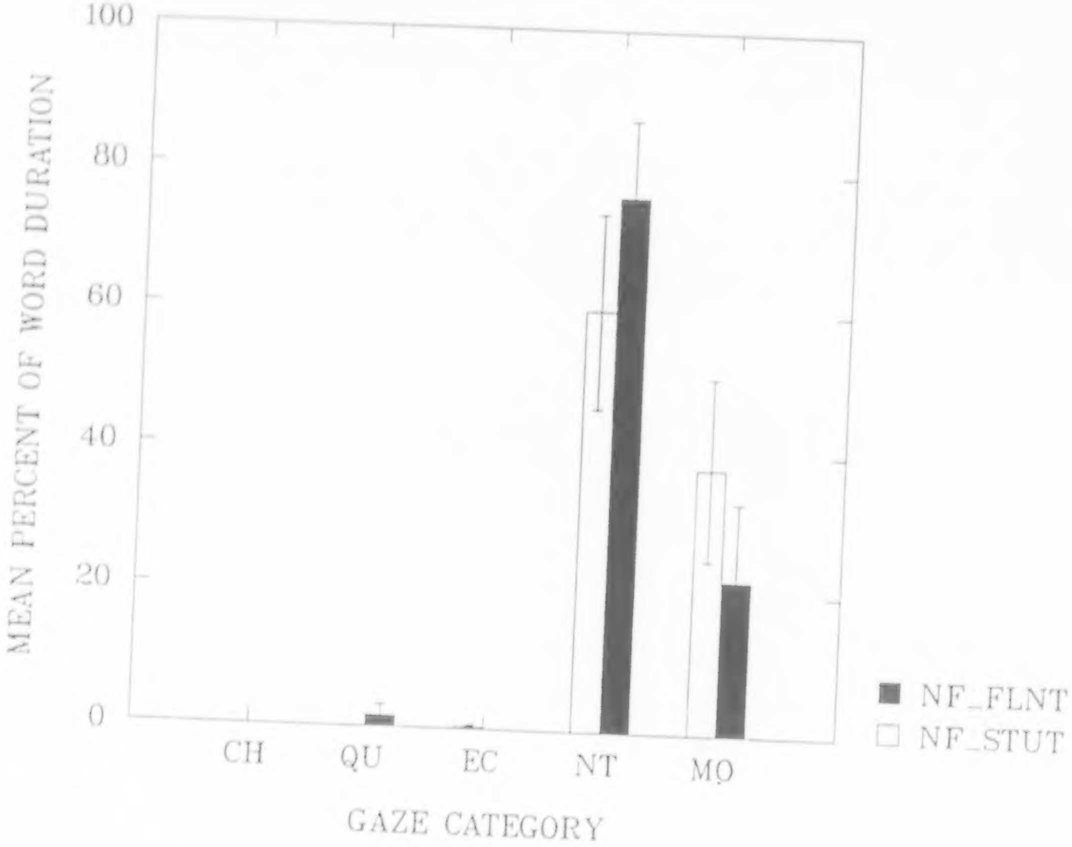

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TABLE 1.: Component and overall scores of each of the 10 young stutterers on the Stuttering Severity Instrument (SSI; Riley, 1980). Subjects are listed in increasing chronological age.

Subject's Chronolog. Age (Yrs;Mos):	Score for Frequency of Stutt. (Non-Readers):	Score for Duration of 3 Blocks:	Score for Distractibility of Physical Concomitants:	Total Overall Score:	SSI SEVERITY RATING:
3;6	12	3	1	16	MODERATE
3;11	16	3	2	21	MODERATE
4;0	14	2	1	17	MODERATE
4;5	14	3	2	19	MODERATE
4;10	14	3	5	22	MODERATE
5;0	14	3	4	21	MODERATE
5;2	12	1	1	14	MILD
5;5	10	1	3	14	MILD
5;6	10	2	1	13	MILD
5;11	16	4	10	30	SEVERE

TABLE 2.: Numbers of Ocular and/or Ocular-Related Behaviors (ORBs), neutral (NEUT.), and not visible (NOTV.) facial gestures for each talker group (stutterers and normally fluent) by children and mothers, and for stuttered and fluent words. Neutral facial gestures were defined by the lack of any discernible ocular or ocular-related behaviors (Ekman & Friesen, 1978), including eyelid, head, eyeball movements, as well as any hand or torso movement that acted to make or break eye contact or individual gaze. Not visible behaviors were defined as instances when either: (a) the eyes were not visible, (b) lower face was not visible, (c) half face was not visible, or (d) entire face was not visible (as illustrated by Conture & Kelly, in press, Figure 3).

BEHAV:	Young stutterers during stuttering	Mothers of stutterers during stuttering	Normally fluent children during fluency	Mothers of Norm. fluent children during fluency
ORBs:	140	151	61	54
NEUT.:	15	27	41	49
NOTV.:	35	12	8	5
TOTAL:	190	190	110	108

BEHAV:	Young stutterers during fluency	Mothers of stutterers during fluency	9 Normally fluent children during stuttering	9 Mothers of Norm. fluent children during stuttering
ORBs:	40	37	20	21
NEUT.:	53	67	8	6
NOTV.:	9	2	0	1
TOTAL:	102	106	28	28

APPENDIX I:
20 EYEBALL, EYELID, AND HEAD BEHAVIORS OPERATIONALLY DEFINED

(from FACS Manual; Ekman & Friesen, 1978; pp. 2-11 to 9-16)

NOTE: Photographs are displayed throughout the FACS manual, which allow the investigator to determine cut-off points (minimums) of scoring each behavior.

EIGHT HEAD MOVEMENTS/HEAD POSITIONS: For both horizontal and vertical eyeball conjugal movements, investigator must determine if Eye Turns are independent from Head Turns. In this study, the investigator covered the videotaped image of the subjects' eyes to determine whether head and eye behaviors were co-occurring or occurring independently. When in doubt, the investigator scored head rather than eyeball turn.

HORIZONTAL:

(1) *Head Turn Left, or*

(2) *Head Turn Right*: Head Turn becomes scorable when "...the amount of cheek exposure on the two sides of the face has become apparently different. ... If 12 o'clock is where the nose is pointing in the neutral position, a scorable Head Turn Left/Head Turn Right is when the nose points 11 o'clock or 1 o'clock." There must be no doubt that there is a shift from the midline.

VERTICAL: Minor variations of up and down head movements are not scored.

(3) *Head UP:* Investigator should: (a) cover the image of eyes to determine if the requirement is met; and (b) check the minimum requirements with the photographs provided.

(4) *Head DOWN:* Investigator made sure that: (a) chin was "pressed in sufficiently to cause quite considerable 'double-chinning,'" and (b) check the minimum requirements with the photographs provided.

TILTS:

(5) *Head Tilt Left, or*

(6) *Head Tilt Right:* Investigator must: (a) "be able to establish the midline of the face and torso if the subject were in a straight and upright position," and (b) observe the head "cocked to one side or the other."

FORWARD/BACK: Minor variations of forward and back head movements are not scored.

(7) *Head FORWARD:* Investigator "should see the head move markedly forward towards the camera, sufficiently so that the head is moving somewhat down (not pointed down) as well as forward."

(8) *Head BACK:* Investigator "must see the gathering of skin under the chin and it must not be due to the head angling down."

FOUR EYEBALL MOVEMENT/EYE POSITIONS:

HORIZONTAL:

(1) *Eyes Turn Left, or*

(2) *Eyes Turn Right:* There must be no doubt that there is a shift from the midline.

There must be a grossly different amount of sclera on either side and a definite variation from neutral of the iris in order to score Eye Turn.

VERTICAL: (Again, minor variations of up and down eyeball movements are not scored).

(3) *Eyes UP:* Investigator must: (a) be able to see "sclera below the iris;" (b) be able to "see all of the bottom of the iris;" and (c) not be able to see the top part of the iris."

(4) *Eyes DOWN:* Investigator must not be able to see: (a) all of the bottom of the iris any longer; nor (b) all of the pupil any longer.

EIGHT EYELID FACIAL ACTION UNITS (AUs): Minimum requirements for scoring each are as follows:

(1) *Upper Lid Raise:* "(a) If upper lid covers part of iris in neutral face, upper lid raise must be sufficient to expose virtually (very nearly) entire iris. (b) If entire iris shows in neutral face, upper lid raise must be sufficient to expose upper sclera above iris, more than just a hairline of sclera is required."

(2) *Lid Tightener:* "(a) Slight narrowing of the eye opening (due primarily to lower lid raise); or (b) The lower lid is raised and the skin below the eye is drawn up and/or medially towards the inner corner of the eye slightly; or (c) Slight bulge or pouch of the lower eyelid skin as it is pushed up."

(3) *Lid Droop:* (a) There is a slight increase in the amount of upper eyelid exposure that is not only the result of inner plus outer brow raise, or of the eyes being directed downward; and (b) The eye opening is markedly less wide than usual and Lids Tight cannot be scored...and the eyes have not yet closed to a slit or completely closed."

(4) *Slit:* Minimum requirements for scoring a slit are as follows: (a) "The eye opening is as narrowed as possible without being closed; and (b) The eyelids are relaxed, not tensed; and (c) Requirements (a) and (b) are met for more than 1/2 second."

(5) *Closed:* "(a) The lids must be touching; and (b) Eyes must remain closed for more than 1/2 second; (c) If the action is unilateral, then eye must [either] remain closed more than 2 seconds or if the eye closure duration is more than 1/2 second and less than 2 seconds, then don't score Lids Closed if the requirements for scoring Wink are met."

(6) *Squint:* "(a) The eye narrowing is much greater than in the usual 7; most of the iris is not visible; and (b) The eyelids appear tensed, not relaxed, and there is bagging, bulging, or tensing of the lower eyelid."

(7) *Blink:* "(a) The eyes (or one eye in a unilateral blink) must close for a moment, and then return to an open position. If bilateral, the eyes cannot be closed more than 1/2 second in the blink, OR it is scored as eyes closed; (b) If unilateral, duration cannot always be used to distinguish blink (AU #45, cannot be more than 1/2 second) from wink (AU #46, cannot be more 2 seconds). To score a unilateral blink, requirement (a) must be met and the eye closure must not appear to be intentional (see AU #46)."

(8) *Wink:* "(a) The eye closure must be unilateral and have a deliberate pause or hesitation; and (b) The eye closure must be shorter than 2 seconds."

NEUTRAL AND NOT VISIBLE BEHAVIORS OPERATIONALLY DEFINED

(from FACS Manual; Ekman & Friesen, 1978, pp. 10-2 to 10-3)

(1) *Neutral:* "If there was no detectable action of any kind, the face is scored NEUTRAL (AU #0). Neutral is scored only once for a facial event and cannot be scored with any other AU or AD [Action Descriptor]." For the purposes of this study "action of any kind" refers to any of the 20 ORBs stated above.

(2) *Not visible:* "When you cannot score a facial area because it is not visible, use a score of #70 if the brow is not visible, #71 if the eyes are not visible, #72 if the lower face is not visible, and #73 if the entire face is not visible."

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Chapter 1

CHILDHOOD STUTTERING: WHAT IS IT AND WHO DOES IT?

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The purpose of this chapter is to discuss the current state of affairs with regard to the definition of childhood stuttering and the classification of young speakers as stutterers. While some of this discussion may be similar to that pertaining to adults, much of it is unique to children, for example, the overlap in the number and nature of speech disfluencies between normally fluent and stuttering children. Although we will note roadblocks to research with young stutterers due to problems with definition and categorization, we will also make suggestions for changes in methodology as well as future directions for research. As we will try to show, our ability to define stuttering and categorize stutterers impacts nearly every facet of our study of stuttering in childhood.

DEFINING STUTTERING

State of the Art

Speech, like many other behaviors, is occasionally produced, by all speakers with hesitations, interruptions, prolongations, and repetitions. These disruptions in the fluent or forward flow of ongoing speech behavior are termed *disfluency* and their frequency, duration, type, and severity vary greatly from person to person and from speaking situation to speaking situation. Some of these speech disfluencies, particularly those which involve within-word disruptions such as sound or syllable repetitions, are most apt to be classified or judged by listeners as *stuttering* (e.g., Boehmler, 1958; Schiavetti, 1975; Williams & Kent, 1958; Zebrowski & Conture, 1989).

Definition of terms. Given that listeners typically judge within-word speech disfluencies as stuttering, we will define, for the purpose of this chapter, *stuttering* or *stuttered* speech as any within-word speech disfluency, for example, sound/syllable repetitions, sound prolongations, broken words, and so forth (cf. Johnson, Darley, & Spriesterbach, 1963, pp. 209–210). (This does not deny the importance of disruptions in rate, pitch, loudness, facial gestures, and the like to a description of stuttering; however, for the purposes of this discussion, these disruptions will not be viewed as the sine qua non of stuttered *speech* and will instead be considered as events *associated* with stuttered speech.) *Fluency* or *fluent* speech will be defined, for the purposes of our discussion, as *speech whose rate, rhythm and forward flow is free from any overt hesitations, repetitions, prolongations, interruptions, or stoppages.* Some of these "hesitations, repetitions . . ." (i.e., disfluencies) in fluent speech consist of within-word disfluencies or stutterings (e.g., sound/syllable repetitions) while others consist of such between-word disfluencies as revisions, phrase repetitions, interjections, and so forth (i.e., "normal" disfluencies). As we will see, there is considerable "overlap" in the number of between- as well as within-word disfluencies between children considered to be normally fluent and those considered to be stutterers, particularly during early childhood.

Terms typically used to describe various aspects of stuttering and disfluency—*frequency, duration, severity, disfluency type*, and *associated behavior*—will also be defined as they are used in this discussion. *Frequency* of stuttering refers to the number of instances of stuttering per some unit of speech, usually 100 words or syllables of reading or conversational speech. *Duration* of stuttering refers to the temporal length, in milliseconds or seconds, of an instance of stuttering, usually averaged over a randomly selected sample of several instances of stuttering within a reading or conversation. *Severity* of stuttering refers to the subjective, rather holistic, judgment of the degree of stuttering exhibited by a stutterer, usually expressed in terms of *mild, moderate*, or *severe* and relates to the stutterers' problem as a whole but can also be applied to separate instances of stuttering (cf. Sherman & McDermott, 1958). *Type* of speech disfluency refers to the various within- or between-word hesitations, interruptions, pauses, prolongations, repetitions, and stoppages that characterize 'stutterers and nonstutterers' speech (cf. Johnson, Darley, & Spriesterbach, 1963, pp. 209–210). *Associated behavior* refers to those speech and

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nonspeech behaviors (cf. Schwartz & Conture, 1988) that occur relatively consistently during instances of stuttering or within-word disfluencies, for example, changes in pitch, blinking of the eyes, covering the mouth with the hand, and so forth.

In this section we will make two major points with regard to the definition of stuttering in children: (a) there are *no known objective, listener-independent* criteria for identifying instances of stuttering or classifying children as stutterers versus normally fluent speakers and (b) there is *no consensus* among experienced clinicians and researchers regarding behavioral definitions of stuttering in childhood or classification of children as stutterers.

No known objective, listener-independent criteria. Presently, there are no known objective, listener-independent criteria for distinguishing between instances of stuttering and instances of other types of disfluency or for classifying which young talkers are stutterers. As Young (1984) notes, there is "... no test within science which can determine once and for all whether a fluency departure is a stuttering instance or a nonstuttering disfluency" (p. 13). Bloodstein (1987) states that, "... the identification of moments of stuttering always involves the judgment of a listener" (p. 4). Similarly, Young (1984) says that the "... ultimate detection and measurement instrument for stuttering and stutterers is a human observer, as it should be, since 'stuttering' and 'stutterers' represent human judgments" (p. 28). Young (1984) further states that "All tools of measurement, both acoustical and physiological, eventually must be validated against the judgments of human observers" (p. 28). Ironically, even though listener judgments and labelling of certain disfluencies as stuttering are subjective, these judgments and labels are relatively consistent within and between trained judges. Agreement among observers is generally higher, however, for total instances of stuttering than for unit-to-unit or identical instances of stuttering (e.g., Curlee, 1981).

As Conture and Schwartz (1984) note, "... it is still unclear whether such labeling, by listeners, reflects (a) listeners' unconscious intuitions regarding speakers' speech behaviors that do and do not indicate a speech problem or (b) listeners' learned, perhaps culturally determined, intolerance for certain forms of speakers' speech behavior" (p. 1). Despite theoretical concerns about the reliability and validity of these judgments, listeners have and will continue to make such judgments until the professional community begins to provide some guidance in the form of definitions of childhood stutterings and stutterers based on consensus.

Lack of consensus regarding behavioral definitions. Related to the fact that our definitions of stuttering in childhood are subjective as well as listener-dependent is the fact that experienced clinicians and researchers alike have not reached a consensus on behavioral definitions of childhood stuttering. It is this writer's opinion that professionals who are involved with stutterers, from either a clinical or research point of view, now have enough information to begin developing a consensus definition of instances of stuttering in children. Arriving at consensus will not solve all problems of definition and terminology but it should help these same professionals more clearly, precisely and reliably communicate between themselves regarding childhood stuttering. It should also help these workers develop less ambiguous measurement and subject selection procedures as well as clearer and more precise reporting of same in scholarly journals and professional conferences.

Needed Knowledge and Research

The above description of the state of the art regarding the definition of stuttering in childhood is suggestive of areas where further knowledge and research is needed. It is not our purpose in the following section to specifically design studies as much as to suggest areas where knowledge is needed and/or where further research might be productive. While some of these studies would be experimental others would be descriptive but all should advance, to greater or lesser degrees, our understanding of how to describe and define instances of stuttering in young speakers.

Definitions based on clear, precise and intention-free terminology. Terminology is needed to more clearly and precisely describe instances of stuttering as well as other speech disfluencies. This is not a new concern; Wingate (1964) voiced the same concern when postulating guidelines for the definition of stuttering. Old or new, however, the problem of unclear, imprecise terminology for describing stuttering and stutterers still remains. At least two criteria must be met when developing terminology that clearly and precisely defines and describes stuttered speech. First, terms used to define, talk and write about instances of stuttering should be, as much as possible, stated on a descriptive level of verbal abstraction (cf. Johnson, 1946, pp. 127–142). This involves descriptions based on direct observations (i.e., first-order verbal abstractions) of speech and related behavior, for example, "He exhibited 3 sound/syllable repetitions per 100 words of conversational speech." Such descriptions are preferable to abstracting of inferences based on descriptions (i.e., a second- or third-order verbal abstraction), for example, "He is repeating because he is nervous." Second, such terminology should be intention-free, that is, eschew interpretation in favor of description of behavior. It will be very difficult to achieve clear and precise terminology as long as we mix our descriptions based on direct observations of behavior together with our idiosyncratic interpretations of the individual's supposed reasons or intention for exhibiting the behavior.

At present, many terms are used which have been borrowed from clinical practice where their use is more utilitarian for communication with lay clients than for the purpose of research. Descriptive terms, like "sound/syllable repetition," are based on observation. They indicate that a sound or syllable is reiterated and do so without allusions to the speaker's reasons or intention for producing it. Other terms, however, like "starter," "filler," or "block," are not only imprecise descriptors of what

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the speech behavior sounded or looked like but they also allude to or make interpretations of the stutterer's supposed reasons for the production of the utterance. Furthermore, terms like *block* or *tense pause* are expressed at more inferential levels of verbal abstraction than descriptive terms such as *sound/syllable repetition*. While more inferential or abstract terms (e.g., *fillers* or *starters*) may have usefulness in certain clinical settings, the purposes of empirical research require clear, precise and intention-free descriptions of behavior (e.g., sound/syllable repetitions).

Objective correlates of subjective listener judgments. Realizing that listeners are the only real judges of whether a particular instance of disfluency is stuttered should not deter us from assessing which, if any, objective measures may correlate with listener judgments of childhood stuttering. While some might argue that it doesn't matter whether we understand the basis for judges' perceptions of young stutterers' speech as long as the judges are internally and externally in agreement, it does matter when trying to devise tests of stuttering severity that have clinical as well as experimental usefulness, when instructing judges what they should be basing their judgments upon or when training student-clinicians or clinical scientists.

Such objective measures could take a variety of forms: acoustic measures of duration, intensity or frequency components of speech; level of physical tension in speech musculature; onsets and offsets of movements of oral structures; or pressure/flow measures associated with speech production. When describing young stutterers' stutterings, experimenters should, at the very least, routinely specify both the type of measured speech disfluency and associated phonetic features. Such specification would go a long way towards developing a useful, objective index of stuttering for the purposes of descriptive as well as experimental research.

One interesting attempt to make objective measures of stuttering and correlate them with listener judgments was reported by Howell, Hamilton, & Kryiacopoulos (1986). Acoustic representations of stutterers' repetitions and prolongations were "automatically recognized" by means of computer algorithms. Howell et al. (1986) considered not only the characteristics of the various instances of stuttering but also the associated phonetic elements and reported 100% computer recognition of 8 repetitions and 70% recognition of 7 prolongations. However, as other acoustic studies of stutterers' stutterings point out (e.g., Howell & Vause, 1984; Howell, Williams, & Vause, 1987; Kelly & Conture, 1988), the acoustic characteristics of stuttered speech make it highly unlikely that *all* instances and types of stuttering will be accounted for by a *single* algorithm or objective measure.

Until we know which, if any, objective measures are reliably associated with listener judgments of instances of stuttering in children, definitions of stuttering in childhood must rely on the judgments of trained observers who agree with the judgments of other trained observers. This is problematic because it continues to place listeners in the position of judging whether something has or has not occurred. Particularly in those studies where changes in stuttering behavior are the basic data, listener bias can be a tremendous factor. Indeed, pre- versus post-therapy studies are difficult enough due to such variables as the Hawthorne effect (cf. Homans, 1965; that is, people changing their behavior simply because they know they are in a study or because experimenters pay attention to them) without have to contend with uncontrolled listener bias as well. Ideally, such objective measures would have research applications as well as clinical utility. That is, the methods needed to make such measures would be based on events and behavior a clinician can directly and readily observe, collect, and interpret.

Average and range of disfluencies in normally fluent youngsters. Research is needed to specify the number and variety of speech disfluencies that occur during typical conversations of children between 2 and 7 years of age. While Johnson (1959) and his colleagues' data are of tremendous assistance in this regard (and, in recent years, those of Yairi 1981, 1982; Yairi & Lewis, 1984), they still do not make clear what the central tendencies and variability of speech disfluencies are for 2-year-olds, 3-year-olds, and so forth. Without this information it is hard to assess the extent to which a child suspected or known to be a stutterer deviates from his or her age norms or how closely an individual normally fluent child approximates them. Although our information on the characteristics of young stutterers is improving, for example, the *Stuttering Severity Instrument* (Riley, 1980), we are still less than clear how these characteristics compare with the population of normally fluent children.

Relation of changes in time/tension of speech production to listeners' judgments of speech disfluency. Research is also needed to assess the influence of time on listeners' perceptions of young stutterers' stutterings. Because it has been speculated that stutterings are related, at least in part, to disruptions of the physical tension/temporal aspects of speech production (e.g., Conture, Colton, & Gleason, 1988; Starkweather, 1987, p. 143–154; Van Riper, 1971, 1982), it seems important to understand how changes in one or both of these variables—time or physical tension—are most clearly related to listener judgments of stuttering. Listener perceptions of stuttering may be as much related to their sense that "too much time has been taken up" by an instance of stuttering as it is to their perception that the sound, syllable, or word was reiterated or prolonged "with too much tension."

Indeed, Franken's (1987, 1988) perceptual rating scales used to judge various aspects of stutterers' speech (e.g., naturalness, speaking rate, voice quality, etc.), suggest that "tempo" is highly related to listeners' perception of differences in stutterers' pre- versus post-therapy speech. Franken's observations are consistent with Prosek & Runyan's (1983) finding that manipulations of phonetic-segment and pause duration influenced listeners' discrimination of treated stutterers from nonstutterers. Prosek and Runyan (1982) had previously reported that speaking rate and pauses also influence listeners' ability to differentiate stutterers' fluent speech (i.e., speech con-

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taining no overt stutterings) from that of nonstutterers. In summary, changes in the temporal aspects of speech production appear to be associated with listeners' perceptions of treated adult stutterers' and this type of research is also needed to assess the speech of treated children who stutter.

Consensus definitions of stuttering in children. A consensus definition of stuttering in childhood is needed. A consensus definition is only possible, however, if we realize that identification of instances of stuttering is based on human judgment and is not the result of some physical or natural law. Considering certain speech disfluencies as "stuttered" and others as "normal" would be a bit like the arbitrary borders used to mark the beginning of one state and the end of another. For example, on one side is Vermont and on the other is New York, not because of natural law or differences but because custom, convention, and arbitrary but agreed-upon law so decree.

A consensus definition would help experimenters and clinicians come to an agreement regarding those speech disfluencies produced by children that they consider as "stuttered" and those that they call "normal," regardless of the basic arbitrariness of this agreement. If such agreement took place, this would tell others, at the very least, what we are talking about when we label as "stuttered" selected aspects of a child's speech behavior. Agreement would lead to better communication, less argument over whether "stuttering" did or did not occur and a greater chance for independent investigators to replicate findings.

Liabilities of consensus definition of stuttering in children. It is unclear whether behavioral definitions of stuttering would increase or decrease interobserver agreement on either total frequency of stuttering or on specific words stuttered (unit-by-unit) based on the somewhat contradictory findings of Young (1975) and Martin and Haroldson (1981). Young (1975) found more instances of stuttering marked under the "stuttering-undefined" condition whereas Martin and Haroldson (1981) found less stuttering marked under that condition. Thus, findings suggest that increasing agreement on stuttering between observers is not as simple as merely giving all observers the same behavioral definition of stuttering.

Even with a consensus definition of stuttering in childhood, some instances of stuttering are probably going to be difficult to readily and reliably perceive because of their brief, inaudible, and nonvisible nature, for example, short, inaudible sound prolongations. Furthermore, certain disfluency types may more closely mimic or resemble nonstuttered types of speech disfluency than other disfluency types. For instance, sound/syllable repetitions may be easier for judges to agree on an instance of stuttering than sound prolongations (cf. Zebrowski & Conture, 1989).

DEFINING WHO IS A STUTTERER

State of the Art

On the surface, it seems that categorizing a child as a stutterer is simple. However, because the definition of stuttering itself is still unclear, our definition of stutterer must also remain unclear. As Young (1984) points out, however, even "Untrained observers (can) make a clear distinction between stuttering and stutterer, using the former classification more frequently than the latter label, and believe that an individual can stutter without also being a stutterer" (p. 27). Thus, instances of stuttering are necessary but not sufficient for an individual to be classified as a stutterer.

The biggest problem with differentiating children who stutter from those who don't is the fact that there is an overlap in the number and nature of speech disfluencies exhibited by the two talker groups. However, if we study the speech disfluencies of one of the largest available samples of young stutterers ($N = 89$) and their normally fluent peers ($N = 89$) (Johnson et al., 1959), we see that even though there is overlap, the number and nature of speech disfluencies produced by the two groups are not carbon copies of one another. In fact, data from the Johnson et al. (1959) study shows that young stutterers (a) produce more speech disfluencies than their normally fluent peers and (b) are much more apt than their normally fluent peers to produce certain types of speech disfluency. For example, Johnson et al. (1959) reported that 70% of children labeled as normally fluent produce 1.0 or less *within- word* speech disfluencies, while only 20% of children labeled as stutterers produce so few. Johnson et al. (1959) also reported that 50–60% of stuttering children produce 3.0 or more within-word disfluencies, while less than 10% of normally fluent youngsters do so. Similarly, Yairi and Lewis (1984) reported that part-word repetitions were the most frequent type of speech disfluency produced by 10 2- to 3-year-old stutterers within 2 months of the onset of their problem (part-word repetitions being very infrequently produced by normally fluent children).

In essence, there is far less overlap between young stutterers and normally fluent talkers in the frequency of their *within- word* disfluencies. Even so, there is no known behavior, speech or otherwise, that young stutterers exhibit that young nonstutterers *never* exhibit. There is no published evidence that the speech disfluency of young stutterers' disfluency is *categorically* different from that of their normally fluent peers.

Deciding who is and who is not a stutterer must necessarily, therefore, be based on *relative* versus *absolute* criteria. Ideally, as was discussed with the definition of stuttering, these criteria would be (a) intention-free, amenable to external observation, and objectively measurable and (b) descriptive of speech and associated nonspeech behavior. Whatever criteria are used, research is needed to determine the relative frequency and types of speech disfluencies which a child can exhibit and still have a *high probability* of being considered a normally fluent speaker. Based on what we have discussed, it would appear unrealistic to expect to develop criteria which could be used, with total certainty, to judge who is and who is not a stutterer. What we are talking about here are statements of probability rather than statements of

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certainty. It is not the mere presence but the relative amount of frequency and type of a child's speech disfluency that help us to decide whether the child should be considered a "stutterer." What is missing, however, are some guidelines for determining when the probability is high that a particular frequency or type of disfluency is or is not of concern (i.e., is or is not sufficient grounds to say that a child is *at risk* for developing a stuttering problem).

A variety of tests are used to assess the speech and related behaviors of children known or suspected to be stutterers (Brutten, 1982; Guitar & Peters, 1980; Johnson, Darley, & Spriesterbach, 1963; Riley, 1980; Riley, 1981; Stocker, 1976; see Conture & Caruso, 1978 for review of Stocker, 1976; Thompson 1983), but most of these attempt to qualitatively and/or quantitatively specify the *degree* or *severity* of the stutterer's problem rather than differentiate stutterers from nonstutterers. In essence, most of these tests assume that the individual under consideration *is* a stutterer (with the only question being the "degree," "severity," or "type" of stuttering). However, at least two of these tests (the Iowa Scale and the Stuttering Severity Instrument) do provide some information that permits comparison to speech behavior expected from the normally fluent speaker (cf. Conture & Caruso, 1987, pp. 89–90 for more detailed discussion of these tests). Furthermore, attempts have been made to refine scaling procedures for assessing, for example, the severity of stuttering (cf. Schiavetti, Sacco, Metz, & Sitler, 1983), but, as noted above, the criteria that underlie judges' decisions about stuttering are still less than clear.

In summary, a listener is most apt to judge a child to be a stutterer if that youngster exhibits enough of the types of behaviors that the listener judges to be stuttering! In essence, there is no purely objective means for determining whether a child is a stutterer any more than there is for deciding which sound, syllable, or word is stuttered. Listeners can be and are trained, however, to make this judgment with a high degree of internal agreement as well as agreement with others.

Needed Knowledge and Research

The above description of the state of the art regarding categorizing children as stutterers is suggestive of areas where further knowledge and research is needed. It is not our purpose in the following section to specifically design studies as much as to suggest areas where knowledge is needed and/or where further research might be productive. Although some of these studies would be experimental others would be descriptive but all should advance, to greater or lesser degrees, our understanding of how to best differentiate children who stutter from those who don't.

Determining the basis on which experts make their subjective judgments. It would be very helpful to know the basis on which experts in the area of stuttering are able to arrive at their judgments of which children are and are not stutterers. Obviously, these experts are basing their decision on a variety of acoustically as well as visually apparent aspects of speech and related nonspeech behaviors. Thus, experts may use a complex combination of visual and auditory information regarding a child's speech together with linguistic, attitudinal, cognitive, and emotional features exhibited by the child to arrive at their judgments of who is and who is not a stutterer. Perhaps, however, within this complex of information, only one or two objective measures of speech behavior are highly and consistently correlated with experts' judgments. Knowing more about the existence and nature of these measures would seemingly help experimenters and clinicians develop a more reliable, objective, and streamlined means for determining who is and who is not a stutterer and one that would be highly correlated with the judgments of experts.

Variations in young stutterers's stutterings. It would also be helpful to know how subjective and objective assessments of stutterers' stutterings vary over time. For example if one were to sample, across days or weeks, a particular stutterer's stuttering what sorts of variation might one expect between the various samples? Very little is known about variations in the type, duration, frequency, and severity of young stutterers' stutterings across time. Parents tell us that their youngsters' stutterings vary and it seems reasonable to speculate that the greater the absolute frequency of stuttering, the greater the magnitude of absolute variation would appear to casual observers. However, we do not know whether these variations are periodic, quasi-periodic, or aperiodic. Based on our clinical experience, we suspect that variations in young stutterers' are essentially aperiodic because the factors that influence this variation are so great in number and highly interactive.

It would be very instructive to have researchers collect data on, say 30 or so young stutterers at or near the onset of their problem and then follow them for 5 to 10 years during which time they receive *no* speech and language therapy. However, ethical and legal restrictions on withholding services would appear to preclude the possibility of such a study. This is particularly of concern with young children because various clinicians (e.g., Conture, 1990; Gregory & Hill, 1984; Starkweather, 1987) believe early, (i.e., nondelayed) intervention is important for maximal benefits.

Whatever the case, knowing more about variations in youngsters' speech disfluencies would help clinicians and clinical scientists better compare changes associated with therapy with other changes that typically occur over a similar timeframe. Having more objective information regarding expected variations in stuttering would be particularly helpful when trying to assess a child whose frequency of stuttering is at or near the "cut-off" for being considered a normally fluent speaker. These are the children who on Monday may exhibit a frequency of speech disfluency that is within and on Tuesday outside of normal limits.

Consensus definition of stutterer. Researchers and clinicians could reach consensus regarding a classification scheme for deciding which children are and are not stutterers. There is sufficient data (e.g., Johnson et al.,

1959) available to show that certain frequencies of selected disfluency types are more apt to be produced by young stutterers than their normally fluent peers; however, we again note that consensus definitions would have to be based on convention and arbitrary categories. Further, there would always be the false positives (i.e., children whose disfluencies are actually at the high end of the normal range but who are considered to be stutterers) and false negatives (i.e., children who are stuttering but considered to be normally fluent (cf. Conture, 1990, p. 11–12). Even more than with definitions of stuttering, classification of stutterer versus nonstutterer appears to require binary or categorical labels to describe what appears to be a fluid or continuous distribution of behaviors *and* "behavers." It is a little bit like trying to paint stripes on a gravel-covered parking lot in attempts to mark off parking spaces. Although our parking spaces might, at least initially, contain equal space and remain equally distributed throughout the lot, they would soon begin to unpredictably change shape and size because the "categorizing" stripes were applied to a continuously changing and shifting surface.

Reaching a consensus to call a child a "stutterer" requires us, at least for the foreseeable future, to rely on human judgment. However, whether or not a consensus is reached, lay people, clinicians, and researchers alike will continue to judge and label certain children as stutterers even though they lack a modicum of guidelines for doing so. Is it not better to arrive at some reasonable consensus for making these judgments than to capitulate to the belief that consensus is impossible because we seldom obtain complete agreement between and within human judgments?

Consensus agreement need not be absolute. Means and ranges of criteria measures can be stated and children can be considered not just as a "stutterer" or a "nonstutterer" but inside or outside of normal limits or at the lower or upper ends of normal limits or at no, low, medium, or high risk for stuttering. Once again, whether consensus is reached, such decisions are made daily by many clinicians and researchers with few widely accepted guidelines. Stuttering, however, is not a local phenomenon but one that spans the USA and the world and, with a few exceptions (e.g., Bloodstein's 1987, p. 253, discussion of Afrikaans-speaking stutterers' tendency to stutter on word-initial vowels which are typically produced, in the Afrikaans language, with a hard attack), its characteristics are fairly universal. Thus, definitions of who is a stutterer and what is stuttering should not be a local option but an agreed-upon convention that could reasonably apply across a wide variety of settings and for the greatest numbers of stutterers possible.

Liabilities of a consensus means of categorizing children who stutter. The first liability of having consensus on how to categorize children as stutterers is that this may be a unidimensional answer to a multidimensional problem. Stutterers exhibit more than just disruptions in speech prior to and during instances of stuttering. This complex of speech and nonspeech behavior might be inappropriately described or overlooked if the classification were too restricted or unidimensional in nature.

The second liability of having a consensus means of categorizing young stutterers is that certain groups of young stutterers, for example, children who only produce, but consistently so, 1 or 2 within-word disfluencies per 100 words, might not fall within the observable behavioral criteria for classifying who is or who is not a stutterer. At this point, it is unknown whether these "sub-clinical" or potential young stutterers gradually or quickly become normally fluent or whether they become full-fledged stutterers.

A third liability is that consensus definitions, particularly those that are overly rigid, might exclude some youngsters who often wander back and forth across an arbitrarily-agreed-upon border between normal fluency and stuttering. This liability is potentially quite serious because we know that the stuttering of young children waxes and wanes in a relatively unpredictable fashion. We therefore would not want our definition of who is and who is not a stutterer to be so rigid that it would classify a child as a stutterer who is more often normally fluent than stuttering or, conversely, to classify a child as normally fluent who is more often stuttering.

A fourth liability is that any relatively rigid, unifying definition for classifying speakers as stutterers might overlook important behavioral differences *between* young stutterers that may have a great deal of significance for clinical as well as research purposes (cf. Preus, 1981; Schwartz & Conture, 1988). Future research may show that differences *between* young stutterers are just as varied and numerous as, and perhaps more important than, differences between young stutterers and their normally fluent peers.

IDENTIFICATION MEASURES

What Childhood Speech Behavior Should be Considered "Stuttered"?

Clinicians typically use the following aspects of disfluent and related speech behavior when trying assessing stuttering in children: (a) overall frequency of all speech disfluencies (between-word plus within-word); (b) percent of all spoken words and/or percent of all speech disfluencies which are within-word; (c) average duration of instances of stuttering: (d) informal as well as more formal assessment of stuttering severity; and (e) nature and number of associated speech and nonspeech behaviors. Various guidelines for the use of these behaviors when assessing stuttering in children known or suspected to be stutterers have been discussed elsewhere (e.g., Adams, 1980; Ainsworth & Fraser, 1988; Gregory & Hill, 1984) and this discussion will not be duplicated in this space. Instead, we will discuss principles that we think should underlie the measurement of stuttering and related behavior in children. Briefly, these measurements should be: (a) *reliable* between and within independent observers, (b) based on subject-independent or *external observations*, (c)

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sufficiently *variable* to permit differentiation between and within stutterers, and (d) emphasize *objective* measures rather than *subjective* impressions.

First, identification methods should be *reliable* and replicable between and within judges. Although a particular clinician or researcher may be quite internally consistent when identifying which young children are stutterers, it should be possible for appropriately experienced and trained independent judges to make reasonably similar identifications when observing comparable subjects. Ideally, the Sander's (1961) agreement index between- and within-judges should be 0.80 or greater *and* the between- or within-judge measurement error appreciably smaller than any reported experimental effect or between- or within-group differences. At the least, clinicians and researchers should be able to communicate the basis for his or her judgments so that their special knowledge can be passed on to other professionals or the next generation of researchers and clinicians.

Second, the measure under consideration must be sufficiently *variable* to permit differentiation between subjects as well as detection of changes in subjects associated with experimental and therapeutic procedures (we will return to this issue below). If a behavior exhibits little variation from one stutterer to the next, regardless of circumstances, than it is probably not a very useful behavioral measure.

Third, the measure must be *externally observable* to people other than the stutterer. Although stutterers' feelings of anticipation or expectancy to stutter are certainly a reality to the stutterer, the presence or absence of these feelings and attitudes are not easily identified by external listeners. Furthermore, these feelings and attitudes seem to have little relation to at least some objective measures of speech (cf. Kelly & Conture, 1988). This does not imply that clinicians should deny or disregard their young clients' or their parents' descriptions of behaviors or feelings but neither should such descriptions serve the *sole* basis for classifying a youngster as a stutterer. As independent, problem-solving clinicians and researchers, we should strive to be able to produce accurate, reliable, and replicable records of our young stuttering clients' behavior rather than *solely* basing our definitions of "stutterer" on the young subjects' and/or their parents' verbally expressed reports.

Fourth, and finally, the measure should be *objective* to the point that a number or set of numbers can be assigned to it—whether this is a percentage, number per sample, or scale value. Thus, the ideal measure of stuttering would be replicable and reliable within and between judges, be sufficiently variable to permit differentiation among stutterers, be externally observable and objective enough to permit numbers of an ordinal or beyond level of measurement.

What Subject Characteristics Should be Considered When Deciding Which Young Talkers are Stutterers?

When studying children who stutter, researchers may want to control for cognitive, psychological, or physical variables such as intelligence, social adjustment, neuromotor abilities and the like to minimize their influence on their findings. It should be realized, however, that there is presently nothing to suggest which, if any, of these other variables should be considered when trying to identify who is and who is not a stutterer. Stutterers' apparent similarity to normally fluent speakers on these other variables strongly suggests that these variables are of minimal use when classifying individuals who stutter and that speech-related variables are still the most useful in this regard (cf. Schwartz & Conture, 1988). One exception to this would appear to be the child's chronological as well as developmental age in relation to exhibited speech behaviors, for example, the frequency of sound/syllable repetitions. What is "acceptable" fluency and "unacceptable" disfluency probably differ for a 4-year-old as opposed to a 7-year-old but although this seems apparent we still know very little about the relation of chronological and/or developmental age to children's speech disfluencies. In essence, the same criteria used to define stuttering (i.e., Is the measure appropriately reliable and replicable, variable, externally observable and objective?) should be applied when trying to classify children as stutterers or normally fluent speakers.

In an ideal world, our criteria for identifying who is or who is not a stutterer should be highly related to a young stutterers' own internal feelings that they are a stutterer. However, children are less apt than adults to verbally explicate their internal feelings about their speech. At present, therefore, clinicians and researchers must rely on external measures of stuttering rather than young stutterers' verbal reports about themselves and their speech. Indeed, more will probably be learned about the nature, number, and variability of young stutterers' internal feelings about stuttering when we can compare them to definitions of stuttering and stutterers that a majority of external observers have agreed upon.

DIFFERENTIATING "STUTTERED" FROM "NORMAL" DISFLUENCY

Clinical Applications

In our clinical experience, one reasonable initial screening device is the total frequency of speech disfluency. Adams (1980), for example, suggests that an overall frequency of 10% or more, regardless of disfluency type, is useful in distinguishing between children at risk for stuttering and those more likely to be normally fluent. We concur that 10% overall disfluency is a useful benchmark to decide whether a child is or is not stuttering; however, we also try to decide whether the child produces 3 or more *within-word* disfluencies per 100 words of conversational speech. That is, any child who exhibits both 10% overall disfluency *and* who produces 3 or more within-

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word disfluencies per 100 words is, based on our clinical experience, a child who is highly likely to be at risk for stuttering.

Once a child appears clearly at risk for stuttering, than other variables such as nonspeech associated behavior become relevant. These associated behaviors may help clinicians differentiate between young stutterers who should receive immediate therapeutic intervention and those who should be monitored by means of follow-up re-evaluations. For example, young stutterers can be distinguished into five statistically significant subgroups on the basis of the number of different behaviors as well as nonspeech behaviors associated with 10 of their stutterings (Schwartz & Conture, 1988). Knowledge of these five subgroups of young stutterers, based on associated behavior, may eventually find application to the differential diagnosis of stuttering in children. Again it should be pointed out that speech disfluency and associated nonspeech events are behaviors that change over time. Thus, a particular young stutterer may produce 10 stutterings per 100 words today but tomorrow produce anywhere between 3 and 23 stutterings per 100 words. Thus, the clinician, just like the researcher, should obtain not only the child's *average* amount or frequency of stuttering but some *index of its dispersion*, for example, the range.

Clinicians do not find it difficult to decide that a child is "normally fluent" if he or she exhibits extremely fluent speech. (In this writer's experience, this is speech containing 1.0 or less within-word disfluencies per 100 words). Likewise, it is not hard for the clinician to decide that a child is a "stutterer" if he or she produces 10 or more stutterings per 100 words spoken. It is, however, hard for clinicians to decide about a child whose behavior falls between those youngsters who can obviously be classified as normally fluent and those youngsters who can obviously be classified as stutterers. Unfortunately, these "in-between" youngsters represent a sizable portion of all children who stutter. In our clinical experience, these in-between children seem to come in three forms: (a) low or no risk of stuttering, (b) some risk of stuttering, and (c) moderate risk of stuttering. Tests like the Stuttering Severity Instrument (Riley, 1980) or Stuttering Prediction Instrument (Riley, 1981) help but are still less than adequate, in this writer's experience, when describing these in-between children. This is particularly true when trying to classify a child as a "stutterer" or "normally fluent speaker" when the child is producing (a) a small but consistent number of sound/syllable repetitions per 100 words in a physically effortless and/or relatively relaxed fashion, (b) few apparent associated nonspeech behaviors and (c) little or no verbal or nonverbal indications that he or she has emotional/intellectual awareness of his or her speech disfluencies.

Research Applications

Any researcher interested in studying stuttering in children *must* be concerned with whether he or she is studying (a) within- versus between-word speech disfluency and/or (b) children who stutter versus those who are normally fluent. Although most researchers now recognize that listeners typically judge within-word disfluencies as "stuttered," it is not quite as easy for researchers to distinguish between children who are normally fluent and those who stutter. That is, there is always the chance that children that researchers consider as "stutterers" may, with time, become normally fluent and vice versa.

At present, although figures vary, it would seem that somewhere between 50% to 80% of those children originally diagnosed as stuttering become normally fluent (Ingham, 1985; Sheehan & Martyn, 1970). Thus, researchers cannot be *absolutely* certain that those children they consider to be stutterers are and/or will remain so. Furthermore, much of our present information, for example, Sheehan and Martyn (1970), regarding recovery from stuttering is based on retrospective verbal or written reports of teenagers or young adults. Although such data cannot be dismissed out of hand, verbal or written recollections of past events and behavior would not seem to have the same degree of face validity as information gathered from direct observation of young stutterers over a period of years. Researchers who base their understanding of recovery from stuttering during childhood on the verbal reports of young adults' recollections of their past, should remember that these young adults must rely on their memories for these recollections. It is this author's clinical experience, however, that parents' and adult stutterers' recollection about the past, particularly the time, place, and events surrounding the onset of stuttering, is often clouded by the passage of time (cf. Conture, 1982, p. 158–163).

VARIABILITY

Variations in Type, Frequency and Severity of Stuttering

The frequency of stuttering in children varies in a relatively unpredictable fashion (Ainsworth & Fraser, 1988, p. 22; Conture, 1987, pp. 25–26). And, as Robinson (1964) has mentioned, it is the apparent random waxing and waning of speech disfluencies that is one of the more confusing and disheartening aspects of stuttering for the child and his or her parents. It is our observation, and one with which parents generally agree, that the child seems more disfluent when fatigued, answering or asking questions, excited or talking to inattentive listeners (cf. Davis, 1940). Because of such variability, central tendencies *must* be accompanied by indexes of dispersion in order to most closely circumscribe the child's speech behavior.

Although these variations make it difficult to clinically manage or empirically study childhood stuttering, changes in the frequency, type, duration, and severity of stuttering are part of the reality of the problem. Although there is little data to support our claim, it is our observation that the *frequency* of the child's overall disfluency and within-word disfluency is the most variable of all

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measures of stuttering. In our clinical and research experience, variations in frequency by as much as 25 to 50% are not uncommon in children who stutter.

The young stutterer's *type(s)* of disfluency is somewhat less variable. That is, it is our experience that the child's most frequent disfluency type, for example, sound/syllable repetition, remains relatively the same until the child's stuttering problem worsens, at which point there is a gradual change in the most frequently exhibited disfluency type. Generally, in our experience, as the problem "worsens," the child changes from a *reiterative*-movement to a *stabilization*-of-movement type of speech disfluency (cf. Conture, 1990, pp. 23–26).

Duration of stuttering does vary between and within stutterers but its variation is not as readily apparent, at least perceptually, because its variation is in fractions of seconds or milliseconds. Changes in the duration of an instance of stuttering can be made much more apparent to both clinicians and researchers by the timing of instances of stuttering with stopwatches (and, of course, by instrumentally measuring the associated acoustic speech signal.) Although there can be no denying that stuttering duration varies within as well as between stutterers, it is still an empirical question whether differences in duration of stutterers *significantly* differentiate between stutterers for the purposes of either clinical or research endeavors (e.g., Schwartz & Conture, 1988 found duration of stuttering to be of minimal assistance when differentiating among subgroups of young stutterers). Interestingly, however, during therapy it has been our experience that perceived decreases in the duration of stuttering are one of the first aspects of stuttering to change as the child's fluency improves.

Severity of stuttering appears the least variable. Changes in severity, categorically measured as "mild, moderate, or severe," do occur as the problem worsens or improves but the rate of change is much slower. The relative stability of severity judgments probably relates to the fact that each category—mild, moderate, or severe—is sufficiently broad to contain a wide degree of variation. On the other hand, it is probably easier to objectify changes in the frequency of occurrence of all or particular types of disfluency because they can be more finely measured as a percentage and because of their inherent volatility.

Variations Within and Between Young Stutterers

Variations between young stutterers. One issue in the area of childhood stuttering that seems to have generated more heat than light is the discussion of whether there are significant differences between stutterers themselves (cf. St. Onge, 1963). Putting aside for the moment the various theoretical aspects of this discussion, researchers (Daly, 1981; Preus, 1982; Schwartz & Conture, 1988; Van Riper, 1971) are beginning to find evidence that childhood stuttering may not only arises from different origins but once begun the problem may develop along parallel but different routes. We hasten to add, however, that there is little information regarding whether these separate routes are equal in terms of the recovery from the problem or persistence into adulthood or whether the number and nature of these subgroups or clusters change with time. As Schwartz and Conture (1988) point out, one of the better tests of the long-term existence of particular subgroups of young stutterers would be a "longitudinal study whereby cluster analysis was performed on different samples of the same subjects collected at different times" (p. 69). In this way Schwartz and Conture (1988) suggest we would better understand whether "certain subjects might have shifted cluster membership (or whether) the nature and number of clusters themselves remained relatively intact" (p. 69).

Variations within young stutterers. Clinicians who manage stuttering in children must routinely try to decide whether the change in the child's stuttering during therapy is solely due to therapy or simply because of the properties of childhood stuttering. Perhaps individual variations in stuttering reflect variations in the number and type of speaking situations that young stutterers experience at home and elsewhere (e.g., child trying to verbally attract the attention of another child or verbally requesting an object possessed by another child and so forth; (cf. Davis, 1940). Thus, increases or decreases in a young stutterer's stutterings may be associated with changed in various cognitive, emotive, physical, and communicative events internal (e.g., fatigue, excitement, etc.) as well as external (e.g., parental demand for rapid, precise oral language) to the child. Furthermore, these associated events or states interact and vary rapidly as well as unpredictably. Thus, it is not particularly easy to predict, with any degree of precision, when, where, and how much any particular young stutterer will increase or decrease his or her stuttering frequency.

Static versus dynamic variation. Variations between young stutterers can, of course, also be *static* (relatively predictable or constant differences) or *dynamic* (relatively unpredictable, constantly changing differences). Furthermore, both static and dynamic variation can take one or both of two forms: (a) variations in the frequency, type, severity and duration of stuttering and (b) variations in related speech and nonspeech behaviors or attributes. Because most research efforts have chiefly been directed at uncovering differences between stutterers and normally fluent speakers, little is known regarding whether variations *within* and *between* young stutterers are static versus dynamic or most apt to be related to stuttered speech behavior versus other related behaviors.

When managing stuttering in children, clinicians must consider that youngsters who stutter differ between themselves in terms of frequency, duration, type, and severity of stuttering. Likewise, when researching stuttering in children, researchers must consider differences between young stutterers because it has been shown, for example, that differences among stutterers in terms of stuttering severity influence such diverse phenomena as reactions to delayed auditory feedback (cf. Bloodstein, 1987, p. 317) and initiation/execution times for manual and oral counting (e.g., Borden, 1983). Of course, it is possible that differences in other behaviors and characteristics, for

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example, differences in diadochokinetic rate, may more readily account for differences in stutterers' reaction times and reactions to DAF than differences in their severity of stuttering. These, however, are empirical issues which await further study.

ROADBLOCKS TO RESEARCH

Forgetting That the Past is the Best Predictor of the Present and Future

The past is the potentially greatest roadblock to future research in stuttering, at least with regard to the definition of stuttering and categorization of stutterers in childhood. Previous publications in the area of stuttering are replete with reports where childhood stuttering and stutterers were reported on the basis of either vague, unspecified behavioral criteria or consensus judgments of two or three colleagues without explication of the behavioral criteria employed by the various judges. Likewise, this literature contains numerous publications in which the descriptors of stuttering and related behavior involve not only the person's behavior but the observer's guesstimation of the speaker's supposed intention or reason for exhibiting the behavior, for example, "fillers," "starters," and "avoiders." If the past is one of the best predictors of the present and future, then unless change is made, it is unlikely that criterion- or norm-referenced, intention-free definitions of stuttering or stutterers will be developed. Perhaps, as Pogo said, "We have met the enemy and he is us."

Treating Subjective Impressions as Objective Data

There is clearly room for subjective impressions and perceptions in the field of stuttering. However, when they are considered equivalent to descriptions of behavior based on direct observations, there would appear to be cause for concern. For example, it is not unusual for clinicians and researchers alike to report the severity level of their clients or subjects without reporting the criteria used to arrive at these decisions. Mild, moderate, and severe stuttering is meaningless unless the quantitative and qualitative data used to arrive at these decisions are made apparent. At the least, scales like those of the Iowa test (Johnson, 1961) or Stuttering Severity Instrument (Riley, 1980) state behavioral criteria that need to be reached before considering a child a "mild," "moderate," or "severe" stutterer. Unfortunately, researchers all too often ignore these criteria and assume that one person's judgment of "mild" is the same as another's. Thus, two studies, both supposedly containing mainly "severe" stutterers, may indeed contain two groups of subjects that are alike in name only because the criteria underlying the diagnostic labels are not made apparent and may in fact be quite divergent.

Blurring the Distinction Between "Stuttering" and "Stutterer"

All too often, the distinction between stuttering and stutterer is blurred. We have noted that, for example, sometimes a child considered to be normally fluent can produce approximately the same number of sound/syllable repetitions as a child considered to be a young stutterer. Thus, as much as we would like absolute, precise cut-offs for deciding who is and who is not a stutterer, the behavioral overlap between the two populations makes this a difficult proposition. Instead, we must consider what is a tolerable "degree of error." That is, using any set of criteria, what is an acceptable margin of error or probability level that some of the children we call stutterers are or will become normally fluent speakers and vice versa. It can't be over emphasized that normally fluent children produce within-word disfluencies—not very many, but they do produce them.

Replicating Studies but Using Dissimilar Subject

Conture (1987) states that "researchers in the area of stuttering (should) attend to subject and behavioral detail as much as they do procedural and instrumental detail. . . . Until we can replicate ALL aspects of each other's research, the subject and behavioral parts as much as the rest of the method, we can continue to expect to find divergent and inconsistent findings" (p. 121). In other words, one very important reason that replication in the area of stuttering doesn't always succeed is that experimenters pay far less attention to what they are considering stuttering and who they consider stutterers than they do other methodological aspects of their studies. Researchers need to make explicit the decision rules that permitted them to include or exclude a child as a stutterer.

When these subjects and their behaviors are poorly, loosely, or unclearly defined and described it is small wonder that independent replication results in different findings. Only in recent years have experimenters begun to specify the frequency and type of disfluency of their stuttering subjects and the criteria by which they have been evaluated as "mild, moderate, or severe." Although it should be realized that these rather global categories of severity are less than precise descriptors of stuttering, their increased use in published papers reflects a movement in the right direction.

Specification of subjects and behaviors is particularly important with children because they are so rapidly and constantly developing in so many different ways that "careful objective matching of subjects is (essential) if replication is going to stand a chance of confirming previous findings" (Conture, 1987, p. 121). Conture (1987) further states that "results obtained from apparently identical studies of stutterers can be significantly influenced by differences in subjects studied. And, until researchers make such differences more apparent in their subject descriptions, their colleagues will continue to

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find it difficult to sort out the numerous reasons for contradictory findings among studies" (p. 121).

Reporting An "Effect" That is Less Than the Judges' Measurement Error

Any study that measures stuttering frequency as a dependent variable, needs to make clear what is considered stuttering and how the judges agreed with themselves and each other in making these measurements. It is particularly important to know whether any "effect," for example, a decrease in stuttering frequency, is greater than the judge's measurement error. If stuttering decreases by 5% from a baseline to experimental condition, the first question should be: What is the magnitude of difference between observers' judgments of stuttering frequency from one time to the next when compared to the magnitude of the "effect?" It is highly possible that measurement error is greater than the so-called effect of the experimental condition!

Further, if every type of speech disfluency produced by a child is considered stuttering, then it is highly likely that results will differ from those where only within-word disfluencies were considered stuttered. Likewise, if the experimenter is trying to study selected acoustic or speech production events during instances of a child's stuttering but does not specify the number and nature of specific disfluency types assessed, then it is possible that another researcher who tries to replicate this work may obtain different results merely because he or she is examining different types of "stuttered" disfluency such as sound prolongations versus sound/syllable repetitions. For example, Conture, McCall, and Brewer (1977) and Conture, Schwartz, and Brewer (1985) have quite clearly shown that laryngeal articulatory adjustments differ a great deal depending on whether sound/syllable repetitions or sound prolongations are produced as well as the phonetic nature of the sound stuttered upon.

FUTURE DIRECTIONS

Realization That Different Subjects May Produce Different Results

Clinicians and researchers will more clearly explicate the decision rules that permitted them to include or exclude a subject. They will come to better appreciate that stutterers' speech characteristics—frequency, type, and severity of stuttering—need to be made explicit because descriptive or experimental results may systematically differ for different stutterers. For example, a researcher may find slower laryngeal reaction times produced by stutterers with higher frequency of stuttering. Because stuttering doesn't occur in a vacuum and can be associated, particularly in children, with a variety of other speech and language problems, for example, phonological difficulties (e.g., Louko, Edwards, & Conture, 1988; Nippold, 1990; St. Louis & Hinzman, 1988), experimenters will more routinely report whether they screened their subjects for such associated problems. They will do this because they will realize that children who stutter but who *do not* exhibit concomitant problems may have different etiologies (and symptomatologies) than those who *do* exhibit concomitant problems. Such pre-experimental differences between children who stutter may significantly influence experimental findings.

Realization That There Are Important Differences Between Children and Adults Who Stutter

Clinicians and researchers will increasingly realize that it is unrealistic to expect the same number and nature of speech and related behaviors in children as adults who stutter because such expectations disregard the influence of development, learning history, and experience. Simply put, we won't expect to observe the same number and nature of speech and nonspeech behaviors in a child with a 6-month of history of stuttering that we might in an adult with a history of 20 years of stuttering. Clinicians and researchers will increasingly understand how cautious one must be when extrapolating backward from adults to children who stutter or forward from the behavior of children to that of adults. Future research may show that young stutterers exhibit many, if not all, of the same behaviors as older stutterers but only less frequently. To draw an analogy, both children and adults use nouns, but the number and frequency of noun usage is quite different between the talker groups, particularly when we compare preschoolers to adults.

Use of Computers That Model Instances of Stuttering and Help Identify Which Children Are Stutterers

Humans ultimately decide what a stuttering is and who is a stutterer. However, in the future, humans may be helped to better understand the speech production and acoustic signal associated with stuttering by means of computer modelling. Furthermore, computers have been and will continue to be applied to the recognition of instances of stuttering and eventually to the identification of which children are and are not at risk for stuttering. Of course, there is serious danger in relying on any machine to do our thinking for us. Thus, the factual information programmed into the computer should be sufficiently broad and detailed enough to capture the central tendency as well as variations in stutterings and stutterers. Further, the resulting program should be flexible and capable of being highly interactive with the end-user, for example, a clinician. Such flexibility and interactiveness should permit the clinician or researcher to modify aspects of the program as circumstances dictate and should help them see that it is them and not the computer program which must and should make the final decision whether a child's disfluency is stuttered or whether a child is a stutterer. Given these cautions, computer programs have potential for helping clinicians and researchers expand or augment rather than replace their judgment of childhood stuttering. Computer modelling of instances of stuttering and computer-assisted identification of stuttering is an exciting area and one that will receive a fair amount of attention in the years ahead.

Use of Consensus to Decide What Is Stuttering in Children and Which Children Do It

Having agreed to disagree for so long about childhood stuttering perhaps it is now time to agree to agree. To bring the study of stuttering in children more fully into the arena of behavioral science, some degree of consensus of what is and who is stuttering needs to be reached. Although at present and into the immediately viewable future humans will remain the final arbitrators of what is stuttering and which young speakers should be classified as stuttering, there is nothing that says that some reasonable consensus cannot be reached by these same humans. Consensus, of course, is not a cure-all. Some instances of childhood stuttering and youngsters who stutter will be inappropriately labeled and because of this some children may wind up, at least temporarily, receiving inappropriate services. However, objective guidelines should reduce such difficulties from their present level while of course not eradicating them completely. In the area of childhood stuttering, where so many have, for so long, agreed to disagree about this or that theory or therapy, it would seem to be about time that these same individuals began to agree what stuttering is during childhood and which children do it.

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the child who stutters: to the pediatrician

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The Child Who Stutters: To the Pediatrician

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The Child Who Stutters: To the Pediatrician

Most children go through periods of disfluency as they learn to speak. Some will experience mild stuttering, and for others the difficulty will become severe. Early intervention by the pediatrician can help parents understand and thus minimize the problem.

ETIOLOGY

Although the etiology of stuttering is not fully understood, there is strong evidence to suggest that it emerges from a combination of constitutional and environmental factors. Geneticists have found indications that a susceptibility to stuttering may be inherited and that it is most likely to occur in boys. Moreover, female stutterers are at greater risk to have children who stutter than male stutterers.[1] Further support for inheritance comes from twin studies, which have demonstrated a higher concordance for stuttering among both members of identical twin pairs than fraternal twin pairs.[2] Congenital brain damage is also suspected to be a predisposing factor in some cases.[3] For a large number of children who stutter, however, there is neither family history of the disorder nor clear evidence of brain damage.

The onset of stuttering is typically during the period of intense speech and language development as the child is progressing from 2-word utterances to the use of complex sentences, generally between the ages of 2 to 5. The child's efforts at learning to talk and the normal stresses of growing up may be the immediate precipitants of the brief repetitions, hesitations, and sound prolongations that characterize early stuttering as well as normal disfluency*. These first signs of stuttering gradually diminish and then disappear in most children, but some children continue to stutter. In fact, they may begin to exhibit longer and more physically tense speech behaviors as they respond to their speaking difficulties with embarrassment, fear, or frustration. If referral for parent counseling and treatment is made before the child has developed a serious social and emotional response to stuttering, prognosis for recovery is good.

PREVALENCE AND INCIDENCE

About 4% of all children go through a period of stuttering that lasts six months or more. Three-quarters of those who begin to stutter will recover by late childhood, leaving about 1% of the population with a long-term problem.

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*The term "disfluency" means a hesitation, interruption, or disruption in speech. It may be normal or, as in the case of stuttering, it may be abnormal.

Case Example: Tommy, a child with **Normal Disfluency**

Tommy began to use single words at about 11 months and to combine 2 words at 15 months. At 30 months, as he began to speak in longer sentences, he started repeating the first words in sentences. For example, he would ask, "When-when-when Daddy come home?" Tommy's word repetitions continued to occur once or twice in a conversation over the next year as he used longer and longer sentences and learned more and more words. Tommy's grandmother expressed concern that he repeated words a lot when she came to visit. His mother noticed this happened particularly when Tommy's grandmother questioned him about his new baby brother, the family pet, and what games he liked to play. Tommy's mother also noticed that in general he repeated words and phrases and sometimes said "um" when he was excited and had a lot to say.

Tommy's mother was unsure about what to do, however, because she had read that some hesitation was normal in children's speech and it was best not to call a child's attention to it. She decided to talk to her pediatrician about it at Tommy's next checkup. She was relieved to find out that Tommy's disfluencies were normal for his age and that she had been wise not to correct Tommy or give him any advice about talking. Over the next year Tommy's disfluencies were less noticeable. He repeated 2- or 3-word phrases more often than he repeated single words and occasionally stopped in the middle of a sentence and revised it. After he was five, he was rarely disfluent.

Pediatrician talking to mother and son.

The sex ratio for stuttering appears to be equal at the onset of the disorder, but studies indicate that among those children who continue to stutter, that is, school-age children, there are three to four times as many boys who stutter as there are girls.[4]

THE PHYSICIAN'S ROLE

The physician is often the first professional to whom a parent turns for help. Knowing the difference between normal developmental speech disfluency and potentially chronic stuttering enables the physician to advise parents and refer when appropriate. Early intervention for stuttering—which may range from parent counseling and indirect treatment for younger children to direct instruction for older children—can be a major factor in preventing a life-long problem.

DIFFERENTIAL DIAGNOSIS

Normal developmental disfluency and early signs of stuttering are often difficult to differentiate. Thus, diagnosis of a stuttering problem is made tentatively. It is based upon both direct observation of the child and information from parents about the child's speech in different situations and at different times. The following section and Tables 1 and 2 should help the physician distinguish between normal disfluency, mild stuttering, and severe stuttering, so that appropriate referral can be made.

With mild and severe stuttering, the child may tense his mouth and blink or close his eyes.

Normal Disfluency

Between the ages of 18 months and 17 years, many children pass through stages of speech disfluency associated with their attempts to learn how to talk. *Children with normal disfluencies* between 18 months and 3 years will exhibit repetitions of sounds, syllables, and words, especially at the beginning of sentences. These occur usually about once in every ten sentences. After 3 years of age, children with normal disfluencies are less likely to repeat sounds or syllables but will instead repeat whole words (I-I-I can't) and phrases (I want…I want…I want to go). They will also commonly use fillers such as "uh" or "um" and sometimes switch topics in the middle of a sentence, revising and leaving sentences unfinished.

Normal children may be disfluent at any time but are likely to increase their disfluencies when they are tired, excited, upset, or being rushed to speak. They also may be more disfluent when they ask questions or when someone asks them questions. Their disfluencies may increase in frequency for several days or weeks and then be hardly noticeable for weeks or months, only to return again. Typically, children with normal disfluencies appear to be unaware of them, showing no signs of surprise or frustration. Parents' reactions to normal disfluencies show a wider range of reactions than their children do. Most parents will not notice their child's disfluencies or will treat them as normal. Some parents, however, may be extremely sensitive to speech development and will become unnecessarily concerned about normal disfluencies. These overly concerned parents often benefit from referral to a speech clinician for an evaluation and continued reassurance.

Mild Stuttering

Like normal disfluency, mild stuttering may become more noticeable when the child is beginning to talk in 2-word sentences. *Children who stutter mildly* may show the same sound, syllable, and word repetitions as children with normal disfluencies but may have a higher frequency of repetitions as well as longer duration of repetitions. For example, instead of one or two repetitions of a syllable, they may repeat it four or five times, as in "Ca-ca-ca-ca-can I have that?" They may also occasionally prolong sounds, as in "MMMMMMMommy, it's mmmmmy ball." In addi-

Child may shift her eyes to the side and tense her mouth when she stutters.

tion to these speech behaviors, children with mild stuttering may show signs of reacting to their disfluency. For example, they may blink or close their eyes, look to the side, or tense their mouths when they stutter. Another sign of mild stuttering is the increasing persistence of disfluencies. As suggested earlier, normal disfluencies will appear for a few days and then disappear. Mild stuttering, on the other hand, tends to appear more regularly. It may occur only in specific situations, but it is more likely to occur in these situations, day after day. A third sign associated with mild stuttering is that the child may not be deeply concerned about the problem, but may be temporarily embarrassed or frustrated by it. Children at this stage of the disorder may even ask their parents why they have so much trouble talking.

Parents' responses to mild stuttering will vary. Most will be at least mildly concerned about it, and wonder what they should do and whether they have caused the problem. A few will truly not notice it; still others may be quite concerned, but deny their concern at first.

Severe Stuttering

Children with severe stuttering usually show signs of physical struggle, increased physical tension, and attempts to hide their stuttering and avoid speaking. Although severe stuttering is more common in older children, it can begin anytime between ages 1½ and 7 years. In some cases, it appears after children have been stuttering mildly for months or years. In other cases, severe stuttering may appear suddenly, without a period of mild stuttering preceding it.

Severe stuttering is characterized by speech disfluencies in practically every phrase or sentence; often moments of stuttering are one second or longer in duration. Prolongations of sounds and silent blockages of speech are common. The severely stuttering child may, like the milder stutterer, have behaviors associated with stuttering: eye blinks, eye closing, looking away, or physical tension around the mouth and other parts of the face. Moreover, some of the struggle and tension may be heard in a rising pitch of the voice during repetitions and prolongations. The child with severe stuttering may also use extra sounds like "um," "uh," or "well" to begin a word on which he expects to stutter.

Severe stuttering is likely to be persistent. Although the

Case Example: Sally, a child with **Mild Stuttering**

Sally's mother and father were concerned because Sally, age 3, was beginning to avoid speaking. The problem had begun several months earlier when Sally was repeating parts of words, like, "Ca-ca-ca-can I ha-ha-ha-have some?" Then a few weeks ago she had difficulty getting started making the first sound of a word. She would open her mouth, quite wide at times, but nothing would come out. Once she asked her mom, "Why can't I talk?"

Sally's speech and language development had been normal. She began using single words at an early age—9 months—and was speaking in 2-3 word sentences by 13 months. She talked fluently and enjoyed the family's fast-paced conversations and word games.

When Sally's father discussed her speech with Sally's pediatrician, she referred Sally to a speech-language pathologist in private practice who was known to have expertise in stuttering. Once-a-week treatment sessions consisted of parent counseling and play-oriented interactions between Sally and her speech clinician. Over a period of six months the clinician's model of a relaxed, accepting style of interacting, combined with Sally's parents' changes in the intensity of speech and language stimulation at home, eliminated Sally's avoidance of speaking and her inability to get sounds started. She continued to show a slightly greater than normal amount of word repetition and phrase repetition for several more years and gradually developed normal speech.

Case Example: Barbara, a child with **Mild Stuttering**

When Barbara was 3, her pediatrician noticed she was repeating and prolonging sounds when he talked to her. He discussed this with her mother and father and found them to be aware of it. In fact, they had been instructing her to stop and start over again when she repeated sounds. He gave them guidance about slowing their own speech rates and refraining from criticism.

When her parents brought Barbara to his office six months later, for a minor illness, the pediatrician inquired about her speech and found that her parents were frustrated by the lack of change in Barbara's speech and had begun to correct her again. Barbara herself seemed reluctant to talk to him. The pediatrician referred Barbara to a speech-language pathologist who he knew to be experienced with stuttering and continued to counsel the parents to ease conversational pressures on Barbara and refrain from direct correction.

A month later, the pediatrician received a copy of the speech-language pathologist's written evaluation of Barbara. This indicated that her stuttering had progressed from mild to severe, and that the parents seemed willing to change some key variables in the home speaking environment. The plan for treatment included some direct treatment of Barbara's stuttering in the speech clinic.

Several months later, Barbara's parents brought her to the pediatrician for treatment of an infected insect bite. The pediatrician noticed that Barbara's speech seemed to be the same or slightly worse than before. The parents indicated that they didn't see the sense in using slower speech rates themselves and have continued to try to correct Barbara's stuttering by instructions. They had discontinued speech therapy because they were unable to afford it. At present the pediatrician has given them a copy of *Stuttering and Your Child: Questions and Answers* and is counseling them to continue changes at home.

child may have good and bad days, the stuttering will probably occur every day. The persistence of stuttering and the frustration and embarrassment may create a fear of speaking. Children with severe stuttering often appear anxious or guarded in situations in which they expect to be asked to talk.

Parents of children who stutter severely inevitably have some degree of concern about whether their child will always stutter and about how they can best help. Many parents also believe, mistakenly, that they have done something to cause the stuttering. In almost all cases, parents have not done anything to cause the stuttering. They have treated the child who stutters just like they treat their other children, yet they may still feel responsible for the problem. They will benefit from reassurance that their child's stuttering is a result of many causes, and not simply the effect of something they did or didn't do.

The distinctions among normal disfluency, mild stuttering, and severe stuttering are summarized in Table 1: Checklist for Referral.

TAKE-HOME MESSAGE

A child who stutters often feels that he is the only one to have the problem. He will appreciate hearing from his pediatrician that other children stutter, too.

COUNSELING PARENTS

Counseling Parents of a Child with Normal Disfluencies

If a child appears to be normally disfluent, parents should be reassured that these disfluencies are like the mistakes every child makes when he or she is learning any new skill, like walking, writing, or bicycling. Parents should be advised to accept the disfluencies without any discernable reaction or comment. Undue attention may delay the natural tendency for these disfluencies to disappear as the child grows and language develops. Particularly concerned parents may find it helpful to slow their own speech rates, use shorter, simpler sentences, and reduce the number of questions they ask during times when their child is more disfluent. They may also want to arrange times the child can talk to them in a quiet, relaxed environment. They should not instruct the child to talk more slowly or to say a disfluent word over again. Instead, they should concentrate on calmly listening to what their child is saying.

Counseling Parents of a Child with Mild Stuttering

Parents of the child who has a mild stuttering problem should not show concern or alarm, but instead be as patient listeners as they can. Their goal is to provide a comfortable speaking environment and to minimize the child's frustration and embarrassment. Parents are sometimes upset when their child repeats sounds or words, but they should understand that these are just slips and tumbles as the child is learning to match his ability to speak with all the thoughts he wants to get out. If the parents let the child know that repetitive stuttering is acceptable to them, this can help the child's speech and language develop without increased physical tension and struggle.

Parents should also slow their own speech rates to a moderate and calm pace, especially when the child is going through a period of increased stuttering. It is often difficult for busy, concerned parents to provide models of slow speech for the child to emulate. They are likely to need encouragement for continuing this practice

Case Example: Jeremy, a child with Severe Stuttering

Jeremy's speech and language developed more slowly than that of his older sister. He didn't start to speak until he was two; until then, he would point to what he wanted. When he started to speak, he was difficult to understand. Jeremy's parents often had to ask him to repeat what he said. His speech became a little clearer at age 3, when he was using 2-3 word sentences. But at about that time he began to repeat initial sounds of words and soon he was prolonging sounds and opening his mouth extra wide when he couldn't get sounds started. Jeremy's cousin had also been late in developing speech, but never stuttered, so Jeremy's parents assumed he would just outgrow it in time. Unfortunately, the stuttering worsened. Soon Jeremy was saying "um" several times just before a word to get it started, in addition to using facial grimaces and wide mouth postures when he got stuck. When he made several attempts to get a word started without success, Jeremy would say "Oh, never mind" and give up. He was gradually becoming more and more reluctant to talk.

By this time, Jeremy's parents became concerned enough to ask their family physician for advice. After talking to Jeremy, the physician referred them to a speech-language pathologist in a local pre-school program. The speech clinician soon determed that immediate treatment was needed and worked with Jeremy and his family in their home for a year with good initial success. Following this, Jeremy entered first grade and was seen twice a week by the school speech clinician and continues to make good progress. Although he still gets hung up on a word occasionally, his language development is normal and he participates fully in class and in social situations.

after an initial trial. Most children, whether they stutter or not, will benefit from adults' speech that is close to their own natural rate. Children who stutter may feel less need to hurry their speech if their parents speak slowly.

While parents may provide models of a slower, more relaxed way of speaking, they should refrain from correcting, criticizing, showing annoyance, or telling the child to "slow down." This may create a power struggle that makes it more difficult for the child to slow his rate.

It is also important for parents to provide opportunities for one-on-one conversations with the child in a quiet setting, as frequently as possible. These are times when the child has chosen the activity and can experience the feeling it's a time to talk about anything he or she wants. If the child asks about the problem, parents should talk about it matter of factly: "Everyone has difficulty learning to talk. It takes time, and lots of people get stuck. It's okay; it's a lot like learning to ride a bike. It's a little bit tricky at first." The parent may mention casually that going slow can sometimes help or that the child need not hurry, if the child seems to be asking for help.

If the child's stuttering persists for six weeks or more despite these efforts on the parents' part, or if the parents are unable to follow these suggestions, the child should be referred to a speech-language pathologist (see later section on referral). Treatment of the child with mild stuttering may be indirect and focused on creating an environment in which the child feels fairly relaxed about speaking, both at home and in the treatment setting. If more direct treat-

Counseling parents.

ment is needed, the speech-language pathologist should show the child how to produce speech more easily, without increased physical tension and struggle, so that stuttering gradually diminishes into something more like normal speech.

Counseling Parents of a Child with Severe Stuttering

The child with severe stuttering should be referred immediately to a qualified speech-language pathologist for an evaluation, further counseling, and direct treatment of the child if appropriate. Because severe stuttering frequently seems to develop when a child struggles or becomes afraid of or concerned with speaking in response to his milder stuttering, anything that helps the child relax and take his or her disfluencies in stride will be of benefit. Parents should model a slower rate of speaking, but refrain from making suggestions to the child. Rather, they should try to convey acceptance of the child regardless of the stuttering, by paying attention to what the child is saying rather than to the stuttering. The speech-language pathologist working with the child might also encourage the parents to nod or comment on the child's courage for "hanging in there," when the child has a particularly hard time on a word. In addition, the child with severe stuttering would probably benefit from being able to share his or her frustration with his or her parents. This may be difficult in many families, and may be best handled with the help of a speech-language pathologist experienced with the management of stuttering.

Professional treatment of severe stuttering often consists of helping the child overcome the fear of stuttering and, at the same time, teaching the child to speak, regardless of stuttering, in a slower, more relaxed fashion. In addition, treatment is focused on helping the child's family create an atmosphere of acceptance of stuttering and conducive to ease in speaking. During a period of a year or more, the child's stuttering will often gradually decrease in frequency and duration. In some cases, the child may recover completely. Treatment results depend on the nature of the child's problem, the presence of other strengths, the skills of the therapist, and the ability of the family to provide support.

WHEN TO REFER TO A SPEECH-LANGUAGE PATHOLOGIST

Children with severe stuttering problems should be referred immediately. Children who have mild stuttering problems that have not resolved within six or eight weeks, depending on the child, should also be referred. These children should not be given direct treatment if it is not warranted, but their parents will receive support and guidance and they will be followed carefully. Some children with mild problems may receive treatment, but it should be carefully planned so as not to make the child feel apprehensive or self-conscious about the problem. As Table 1 suggests, children with normal disfluency do not need to be referred unless the parents are so concerned that they need reassurance about the normalcy of their child's speech. They may also be followed by the speech clinician to provide additional guidance if needed.

The speech-language pathologist should have a Certificate of Clinical Competence (CCC-SP) from the American Speech-Language-Hearing Association, and should also be licensed by the state in which he or she practices. Certification requires a master's degree from an accredited university, a national examination, and a year of supervised internship. In addition, the speech-language pathologist to whom a child is referred for stuttering should be experienced with the disorder. Many hospital and university speech and language clinics will have such persons on their staff or can suggest one. Most school systems also employ speech-language pathologists.

The Stuttering Foundation of America provides referrals to qualified therapists in most areas of the country. Their toll-free telephone number is 1-800-992-9392. They also provide books for parents: *Stuttering and Your Child: Questions and Answers*, *If Your Child Stutters: A Guide for Parents*, and teenagers *Do You Stutter: A Guide for Teens* for a nominal cost.

CONCLUSION

Pediatricians, family physicians, and other health workers are often the first professionals to whom parents turn for advice about their child's disfluencies. These professionals can help in the prevention of stuttering. Early identification of children at risk for chronic stuttering and appropriate referral is critical. Moreover, effective parent counseling can often create an environment conducive for children to outgrow their disfluencies.

The authors of this booklet too often meet severe adult stutterers whose parents were told "Don't worry, he'll outgrow it" so that the opportunity for therapy when the disorder is most treatable has been missed. We have repeatedly found that when children are referred early, treatment is most effective, even in cases of severe stuttering. Early intervention prevents the development of lifelong habits that interfere with social, academic, and occupational success.

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The charts on the following three pages may be photocopied and distributed without permission of the publisher. ▶

Table 1: PHYSICIAN'S CHECKLIST FOR REFERRAL

	The Child With NORMAL DISFLUENCIES Age of Onset: 1½ to 7 years of age	**The Child With MILD STUTTERING** Age of Onset: 1½ to 7 years of age	**The Child With SEVERE STUTTERING** Age of Onset: 1½ to 7 years of age
Speech behavior you may see or hear:	☐ Occasional (not more than once in every 10 sentences), brief, (typical ½ second or shorter) repetitions of sounds, syllables or short words, e.g., li-li-like this.	☐ Frequent (3% or more of speech), long (½ to 1 second) repetitions of sounds, syllables, or short words, e.g., li-li-li-like this. Occasional prolongations of sounds.	☐ Very frequent (10% or more of speech), and often very long (1 second or longer) repetitions of sounds, syllables or short words. Frequent sound prolongations and blockages.
Other behavior you may see or hear:	☐ Occasional pauses, hesitations in speech or fillers such as "uh," "er," or "um," changing of words or thoughts.	☐ Repetitions and prolongations begin to be associated with eyelid closing and blinking, looking to the side, and some physical tension in and around the lips.	☐ Similar to mild stutterers only more frequent and noticeable; some rise in pitch of voice during stuttering. Extra sounds or words used as "starters."
When problem most noticeable:	☐ Tends to come and go when child is: tired, excited, talking about complex/new topics, asking or answering questions or talking to unresponsive listeners.	☐ Tends to come and go in similar situations, but is more often present than absent.	☐ Tends to be present in most speaking situations; far more consistent and non-fluctuating.
Child reaction:	☐ None apparent	☐ Some show little concern, some will be frustrated and embarrassed.	☐ Most are embarrassed and some are also fearful of speaking.
Parent reaction:	☐ None to a great deal	☐ Most concerned, but concern may be minimal.	☐ All have some degree of concern.
Referral decision:	☐ Refer only if parents moderately to overly concerned.	☐ Refer if continues for 6 to 8 weeks or if parental concern justifies it.	☐ Refer as soon as possible.

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SUGGESTIONS FOR PARENTS OF CHILDREN WHO STUTTER

1. Speak with your child in an unhurried way, pausing frequently. Wait a few seconds, after your child finishes speaking, before you begin to speak.

Your own slow, relaxed speech will be far more effective than any criticism or advice such as "slow down" or "try it again slowly."

2. Reduce the number of questions you ask your child.

Children speak more freely and if they are expressing their own ideas rather than answering an adult's questions. Instead of asking questions, simply comment on what your child has said, thereby letting him know you heard him.

3. Use your facial expressions and other body language to convey to your child, when she stutters, that you are listening to the content of her message and not to how she's talking.

4. Set aside a few minutes at a regular time each day when you can give your undivided attention to your child.

During this time, let the child choose what he would like to do. Let him direct you in activities and decide himself whether to talk or not. When you talk during this special time, use slow, calm, and relaxed speech, with plenty of pauses. This quiet, calm time can be a confidence-builder for younger children, serving to let them know that a parent enjoys their company. As the child gets older, it can serve as a time when the child feels comfortable talking about his feelings and experiences with a parent.

5. Help all members of the family learn to take turns talking and listening.

Children, especially those who stutter, find it much easier to talk when there are few interruptions and they have the listeners' attention.

6. Observe the way you interact with your child.

Try to increase those times that give your child the message that you are listening to her and she has plenty of time to talk. Try to decrease criticisms, rapid speech patterns, interruptions, and questions.

7. Above all, convey that you accept your child as he is.

Your own slower, more relaxed speech and the things you do to help build his confidence as a speaker are likely to increase his fluency and diminish his stuttering. The most powerful force, however, will be your support of him whether he stutters or not.

For more information on stuttering and ways to help your child, write or call the nonprofit

Stuttering Foundation of America
P.O. Box 11749
Memphis, TN 38111-0749
1 (800) 992-9392

The following books are available from them for $1.00 each:

If Your Child Stutters: A Guide for Parents, Publication No. 11, 56 pages,

Stuttering and Your Child: Questions and Answers, Publication No. 22, 64 pages,

Do You Stutter: A Guide for Teens, Publication No. 21, 80 pages.

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TABLE 2. QUESTIONS THAT MIGHT BE ASKED OF PARENTS

Note: These questions are listed in order of the seriousness of the problem. If a parent answers "yes" to any question other than number 1, it suggests the possibility of stuttering rather than normal disfluency.

1. Does the child repeat parts of words rather than whole words or entire phrases? (For example, "a-a-a-apple")

2. Does the child repeat sounds more than once every 8 to 10 sentences?

3. Does the child have more than two repetitions? ("a-a-a-a-apple" instead of "a-a-apple")

4. Does the child seem frustrated or embarrassed when he has trouble with a word?

5. Has the child been stuttering more than a year?

6. Does the child raise the pitch of his voice, blink his eye, look to the side, or show physical tension in his face when he stutters?

7. Does the child use extra words or sounds like "uh" or "um" or "well" to get a word started?

8. Does the child sometimes get stuck so badly that no sound at all comes out for several seconds when he's trying to talk?

9. Does the child sometimes use extra body movements, like tapping his finger, to get sounds out?

10. Does the child avoid talking or use substitute words or quit talking in the middle of a sentence because he might stutter?

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STUTTERING

Edward G. Conture, Ph.D., and
Lesley Wolk, Ph.D.

INTRODUCTION

We frequently hear claims that this or that stuttering treatment is 90% or more effective. Seldom, however, do individuals making such claims clarify what they mean by the word "effective." While caveat emptor ("let the buyer beware") may be the watchword for the wise consumer, all too often the lay public finds it easier to obtain a warranty on a toaster than to evaluate claims that a particular therapy is more effective than another. The public, therefore, must and should turn to professionals to help them understand what is meant by "effectiveness," and how they may best determine whether one therapy is more effective than another.

To begin, let us state some observations regarding stuttering that appear true given our clinical and research experience with this problem. First, almost anything a clinician does, in which she or he and the client believe, will to some degree improve stuttering at least temporarily. Second, stuttering is a behavior that waxes and wanes in relatively unpredictable ways, its one constant being change. Third, long-term follow-up of the results of stuttering intervention probably would not support the claims of some, that 90% or more of all their clients are "cured." In essence, there are several factors that make evaluation of stuttering treatment a complex and somewhat problematic issue. These include: (a) some clinicians fervent but unfounded belief in the efficacy of their approach; (b) the continual waxing and waning of stuttering; and (c) the *long-term* resistance to change in stuttering, particularly in adults. Nevertheless, this is an important area of investigation.

EFFECTIVENESS OF STUTTERING TREATMENT

Defining Effectiveness

Prior to describing the "effectiveness" of stuttering treatment, we need to define what we mean by the term "effective." *Effectiveness* has been defined as the "ability to produce a specific result or to exert a

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specific measurable influence" (Dorland, 1988). It would seem that the effectiveness of intervention is closely related to whether it was "successful" and, as Williams (1978) stated, unless a person who has stuttered "can interact with people and talk the way *they want* to talk, at any time, to any one, *they* still have a problem of stuttering." Thus, there would appear to be subject-independent measures of effectiveness (e.g., frequency and duration of instances of stuttering) as well as subject-dependent measures of effectiveness (e.g., whether the client feels or believes she or he can talk to anyone at any time). Unfortunately, at this writing, it is unclear which of these measures is more important in judging the effectiveness of stuttering treatment.

Fully realizing that "fools rush in where angels fear to tread," we will define, for the purposes of this paper, a treatment to be *effective* if it results in the individual being able to speak with dysfluencies that are within normal limits whenever and to whomever he or she wants to, without undue concern or worry about speaking, 5 or more years after the termination of that treatment. Note that this definition permits the individual to occasionally produce between-word (e.g., revisions, phrase repetition) as well as within-word dysfluencies (e.g., sound prolongations, sound or syllable repetitions). This definition also permits the individual occasionally to be less than totally or completely fluent. After all, speech that is totally fluent (i.e., absolutely free of any type of speech dysfluency) is a speaking goal few, if any of us, can attain.

Our definition does, however, place a premium on the length of time after formal treatment ends; so that a mere 6 to 18 months of relatively fluent speech after treatment would not be sufficient. Perhaps 5 years or more seems rather long, but how many of us would tolerate fillings in our teeth, orthopedic setting of limb fractures, eyeglasses, or the like that only worked for 6 to 18 months after treatment? Research into the long-term (i.e., 5 years or more) effectiveness of stuttering treatment is long overdue.

Unfortunately, and perhaps because speech-language pathologists recognize the complexities of measuring the previously mentioned subjective and objective variables, there has been a dearth of reported empirical investigations of stuttering therapy "efficacy." Ironically, while many want and need information about the efficacy of stuttering intervention, little objective research has been focused on this topic in the past several years. In fact, in the past 5 years, there has been a 50% decrease in the number of journal publications on the treatment of this disorder with probably fewer than five centers throughout the world reporting on any form of stuttering treatment research (Ingham, 1989).

We realize that few present-day "therapies" for stuttering could pass our above-mentioned effectiveness criteria. Does this mean that these "therapies" are not effective? According to our criteria, yes, they would not be considered effective; however, according to other criteria they may indeed be effective. Perhaps our criteria for effectiveness are best seen as the ideal, the target towards which we should strive. What long-term benefit is a treatment, if the client still experiences worry and concern about speaking only 18 months after therapy? Of what benefit is a treatment that requires the client to continually reenter treatment every 3 to 5 years? We realize that these are complex questions that we seem to have dealt with in an uncompromising manner; however, we need to ask ourselves such questions if we ever hope to develop treatments that are effective in the long term rather than merely in the medium to short term.

MEASURING EFFECTIVENESS

By conservative estimate, there are at least 150 studies of stuttering intervention (Bloodstein, 1987). However, the methods used in these studies to assess the results of treatment vary as much as the findings and we will not use this space to discuss these various findings. Others have discussed, in some detail, therapeutic effectiveness (Bloodstein, 1987; Ingham, 1985), and we would like to adapt from Bloodstein's "tests" for assessing whether a method of treating stuttering may be considered successful. We think it fair to state at the outset that few if any presently used treatment methods for stuttering could pass these tests, but once again we are discussing the ideal. We have ordered the first seven of Bloodstein's "tests" in terms of our perception of their importance to the issue of effectiveness of stuttering intervention; we consider the last five as of relatively equal importance and thus the sequence of presentation of these is arbitrary.

1. Have results of treatment method been shown to carry over to situations outside of the clinic? We consider this the most important of Bloodstein's criteria. As Williams (1978) noted, "The goal of therapy is not change in the clinic but change outside the clinic." Many, if not all therapies, result in some change within the clinic but very few can truly claim long-term change outside of the clinic setting.
2. Have results of treatment method been demonstrated by long-term follow-up study? As Bloodstein (1987) noted, however, we still do not know ". . . how long an interval we should allow to elapse between the end of treatment and the follow-up study" (p. 402). He further stated that 18 to 24 months is probably the shortest interval that should be used; however, as noted above we feel that a period closer to 5 years may be appropriate.
3. Have results of treatment left the stutterers free from the necessity to monitor their speech? Clearly, most stutterers, particularly in the beginning stages after formal treatment is terminated, will need to monitor their speech; they will need to be ever vigilant in order to maintain their fluency. The length of time such speech vigilance should last and the amount of effort required will most likely depend on the individual stutterer himself or herself. Clearly, the development of a reasonably reliable method "for evaluating all stutterers' post-treatment vigilance" would be a valuable contribution.
4. Have results of treatment methods been assessed using objective measures (e.g., speaking rate, stuttering frequency)? Unfortunately, objective data are often missing from reports of therapeutic effectiveness and instead are replaced by highly subjective statements like "better than" or "greatly improved." Such statements would not appear to constitute criteria that independent judges or clinicians could easily agree upon or replicate. Suffice it to say that there is a clear need to develop objective, reliable measures to define what stuttering is and who stutterers are, and once these methods are developed, clinicians need to use them during the initial, middle, and final phases of their therapy programs.
5. Have results of treatment methods been based on several adequate samples of speech? As noted above, stuttering is highly variable, and unless the examining clinician or researcher has sampled several times, there is little chance of understanding or portraying such variability. We suspect that reports of tremendous success for this or that treatment are based on unrepresentative post-treatment samples; but of course, this is an empirical issue that must await further study. In reference to this issue, Ingham (1989) stated that we have developed few, if any, credible bases for selecting the frequency and amount of sampling that is necessary to assess treatment efficacy, and in particular, the generalizability of treatment effects. Ingham encouraged, and we concur, the future formulation of guidelines for estimating the amount of speech sampling necessary for the evaluation of effectiveness.
6. Have results of treatment method been shown to be effective with an ample and representative group of stutterers? This addresses the highly complex topic of large- versus small-group research, a topic that goes well

beyond the present discussion. While we personally favor larger-scale studies, a great deal of value can certainly be obtained from careful, well-controlled studies of one to three stutterers if these subjects are representative of the whole, not merely part, of the population of stutterers. It is not, in our opinion, the *size* of the sample—although this can clearly influence findings—as much as the *representativeness* of the sample.

7. Have the results of treatment been shown to be effective after the treatment is no longer new and the initial enthusiasm wanes? Typically, a period of unbridled enthusiasm takes place in the beginning of most new therapies. Such enthusiasm generally continues until the inevitable relapses occur and/or there is a gradual increase in the number of clients who fail. In essence, it takes time to evaluate the effectiveness of a treatment, and when it is new, and untested, generally not enough time has elapsed to evaluate it adequately. It seems reasonable to assume that for stuttering treatment research to have satisfactory internal and external validity, a variety of speaking situations must be assessed at intervals before, during and after treatment (Ingham, 1989).
8. Have results of treatment been demonstrated when compared to control groups or conditions? This is a difficult problem to address. Placebo or dummy therapies are problematic both ethically as well as legally. For adults who stutter, one might randomly assign subjects to "real" and "placebo" therapy but offer the "placebo" group the chance to enroll in the actual or "real" treatment once they have completed the control or placebo therapy. In brief, someone would make a major contribution to our field by developing methodology—which was procedurally, theoretically, ethically, and legally sound—that would allow us to employ control groups and/or conditions with which to compare the results of treatment methods of interest with children as well as adults who stutter.
9. Have results of treatment been shown to produce speech that sounds natural and spontaneous? This has become an increasingly important issue as clients experience interventions that make them more "fluent" but often at the cost of inducing unnatural, staccato, monotonous, and nonspontaneous speech. This is a concern since some stutterers may find that "unnatural" but fluent speech is less desirable than stuttering, and gradually revert to using their previous stuttering pattern.
10. Has the treatment modified the stutterers' fears, anticipations, and self-concepts as a stutterer? This is probably more of an issue for older than younger stutterers, since young children tend to have fewer internalized concerns than adult stutterers. Whatever the case, these internalized concerns are difficult to assess since one must rely on stutterers' self-reports, which are, by their very nature, quite subjective. Truly, the ideal approach, at least for adults who stutter, would be to base our assessment of treatment effectiveness on both the stutterer's external behavior (e.g., stuttering frequency) and internal feelings and beliefs.
11. Have the results of treatment taken into account dropouts? This is a common problem in all treatment research: How many subjects, initially approached, would not participate or meet group membership criteria or could not do assigned procedures? Far too often, methodological problems (e.g., the number and nature of subjects who dropped out or who could not do assigned tasks) are omitted from reports of therapy outcome and effectiveness. This is unfortunate because it does not portray the true picture in terms of what was involved or what occurred during the completion of the study.
12. Have the results of treatment been shown to be effective in the hands of

any clinician? A treatment is of minimal value if only the "experts" can make it work. Indeed, we should be cautious that an intervention is considered "effective" solely due to the "power of suggestion" (Benson and Epstein, 1975; Benson and McCollie, 1979) through association with a well-known, experienced speech-language pathologist. Nevertheless, it is naive to think that less experienced clinicians can make a procedure work as well and as quickly as more experienced clinicians, and this must be taken into account when evaluating treatment efficacy.

WAYS IN WHICH SPEECH-LANGUAGE PATHOLOGISTS ARE EFFECTIVE

It should be clear from the above discussion that determining exactly what we mean by "effective," and consequently "ways in which speech-language pathologists are effective," is an extremely complex issue. Although we cannot presently be certain about the exact ways speech-language pathologists are effective, we can make some reasonable speculations about the relation between various diagnostic and treatment factors and our clinical effectiveness. These factors would appear to range along a continuum from those that are objectively measurable to those that require more subjective means of assessment.

Figure 1 presents a hypothesized relationship between (a) the relative difficulty of assessing various speech (e.g., stuttering frequency) and nonspeech (e.g., "locus of control" or LOC) variables, and (b) the degree of known or demonstrable change in that variable (i.e., treatment efficacy) as a result of intervention. This figure shows the hypothesized degree of treatment effectiveness, ranging from those variables

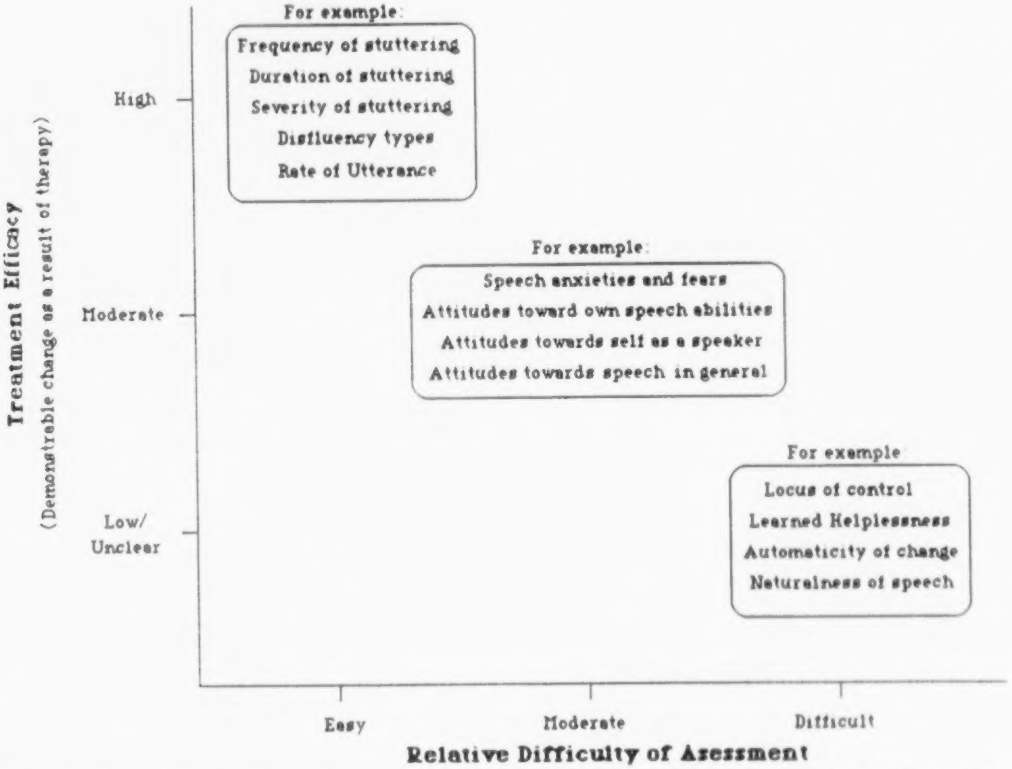

Figure 1. Hypothesized relationship between the relative difficulty of assessing speech (e.g., frequency of stuttering) and nonspeech (e.g., "locus of control") variables, and the degree of treatment efficacy (i.e., known or demonstrable change) for that variable.

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thought to be most clearly effective and relatively easy to assess objectively (e.g., frequency and duration of stuttering), to those variables that are more difficult to assess empirically (e.g., LOC and learned helplessness (LH)) and that we understand very little with regard to treatment efficacy. Our quest for knowledge about stuttering, its development, and its persistence is frequently motivated by our need to be increasingly effective at "helping stutterers help themselves" (Williams, 1982). Indeed, the stutterer needs to develop an inner sense of control and ability to monitor his or her own speech behavior outside the treatment setting. That is, the ultimate goal of treatment is for the stutterer to be able to independently achieve change outside the clinic.

With this in mind, we will consider some concepts that may contribute to effecting change outside the clinic. As shown in Figure 1, these concepts include: LOC, LH, automaticity of change, and naturalness of speech, concepts (a) which are considered quite difficult, although not impossible, to assess objectively, and (b) of which we understand little regarding treatment effectiveness.

Locus of Control

LOC refers to an individual's perceived control over himself or herself and the environment, and is often discussed in terms of the dichotomy between internal and external LOC. Specifically, *internal* control refers to "the perception of positive and/or negative events as being consequences of one's own actions and thereby under personal control" (Rotter, Seeman, and Liverant, 1962, p. 499). In contrast, *external* control refers to "the perception of positive and/or negative events as being unrelated to one's own behaviors in certain situations and therefore beyond personal control" (Rotter, Seeman, and Liverant, 1962, p. 499). As a result of our intervention, we would hope that the stutterer becomes able to achieve a stronger degree of *internal* LOC and thus take more responsibility for his or her own speech behavior rather than attributing the fluency or dysfluency to external factors. Craig and colleagues (Craig, Franklin, and Andrews, 1984; Craig and Andrews, 1985) reported a scale for measuring LOC in stutterers, and have reported on the usefulness of LOC in predicting which stutterers will relapse 10 months after treatment. One might reasonably speculate that improving our understanding of LOC, as well as increasing our stuttering clients' internal LOC, has potential for improving our clinical effectiveness.

Learned Helplessness

Related to LOC is the notion of LH. LH was first described formally by Overmier and Seligman (1967) who demonstrated that when dogs were exposed to a noxious event (e.g., electric shock), which they were unable to control, they learned that their behavior and outcome had no relationship. In essence, the dogs learned that their behavior and outcome were independent of one another; in other words, they became "helpless" in the situation. The concept of LH thus implies that an individual can learn that one's behaviors have little or no influence on or control over any or all situations (Seligman and Groves, 1970). It is suggested that motivational, cognitive, and various emotional factors may be related to the perception of "uncontrollability" or "helplessness" (Maier and Seligman, 1976). Furthermore, an individual with a high degree of LH might take less personal responsibility for his or her behavior. Thus, not unlike a person with a more external LOC, an individual with high degrees of LH may not attribute events to one's own efforts, but rather to luck, chance, or some factor external to oneself (Maier and Seligman, 1976).

Perhaps one of the first discussions of LH or LH-like behavior in speech-language pathology was that of Williams (1957) who suggested that the stutterer may learn that she or he has no control or no choice over the way in which he or she speaks. A stutterer may develop a sense of "helplessness" or "uncontrollability" which becomes reinforced and reduces his or her personal responsibility for the behavior. Thus, "helplessness" may become part of the psychosocial, emotional, or intellectual constructs of the individual stutterer. Psychosocial factors, such as passivity, lack of motivation to change, inaccurate perceptions, and external LOC may be associated with this problem (Seligman and Groves, 1970). The notion of LH corresponds to Williams' proposal (1982) that the stutterer may believe that the stuttering is a separate entity that lies within himself or herself, and such belief leads to a feeling of "helplessness" and "uncontrollability."

Along these same lines, we may need to begin addressing the question of whether we, as clinicians, may perpetuate the stutterer's feeling of "helplessness" by making him or her feel dependent on a particular procedural technique and/or the clinician. If this is indeed true, our evaluation of our own efficacy is intricately related to the stutterer's own perceptions of his or her ability to change the behavior. Thus, the notions of LOC and LH would appear to be meaningfully related to the evaluation of our efficacy. Because these issues are inherently more subjective and abstract in nature, they are also less easily evaluated via objective means (see Fig. 1).

NATURALNESS OF SPEECH

Sometimes stutterers may achieve fluency (i.e., our treatment is "effective") at the cost of reducing the "naturalness" of their speech. Perhaps stutterers whose speech is more fluent but less natural as a result of treatment may eventually choose their old stuttered, but more natural speech patterns, thus rendering an initially "effective" treatment to be ineffective in the long run. Recently, "naturalness of speech" has received some attention in the stuttering literature (e.g., Franken, 1987; Ingham et al., 1989). For example, Franken (1987) suggested that speech naturalness comprises a number of distinguishable aspects of speech, such as rate, articulation quality, and voice dynamics. She developed a naturalness scale, which includes several bipolar ratings such as: slow–quick, unpleasant–pleasant, low pitch–high pitch, soft–loud, and so forth. These scales are believed to yield valid and reliable ratings. However, we are also cautioned that the results tend to be somewhat "global." That is, there appears to be no direct way to determine whether perceived unnaturalness of a speech sample is due to either the rate being too high or too low, the articulation quality being poor, or some complex interaction among these and other variables. The global information obtained from the naturalness scale may, however, be useful if one only has to determine whether the client has met the goal of overall "naturalness."

One of the difficulties in using this scale (and most other scales too) in a clinical setting is determining which specific strategies need modification in the event of a relapse. Clearly, the relationship between stuttering and speech naturalness is an issue that will and should receive a great deal of empirical investigation, particularly with regard to the long-term efficacy of stuttering treatment.

CONCLUSIONS REGARDING EVALUATION OF EFFECTIVENESS

Evaluating the treatment efficacy of speech-language pathologists with stutterers may be viewed on a continuum from more objective to less objective. On one end of the continuum there are several relatively clear, objectively definable and measurable aspects of stuttering, such as frequency and duration of stutterings, dysfluency types, and speech rate. It is quite possible, however, that some of these stuttering behaviors are complexly interrelated with the stutterer's own attitudes and reactions to his or her problem. Therefore, there may be a variety of less clearly defined measures that need to be considered when evaluating our overall treatment efficacy with stutterers.

Figure 1 shows some of these less clearly defined and objectively measurable factors such as a stutterer's (a) anxieties and fears relating to speech, (b) attitudes toward his or her own speech abilities, (c) attitudes toward himself or herself as a speaker, and (d) attitudes toward verbal communication in general. Although not as easy to objectively measure, these variables may nevertheless be relevant in determining the efficacy of our treatment approaches. There are, in fact, scales that would appear to have a reasonable degree of face validity for assessing attitudes relative to speaking (e.g., Communication Attitude Inventory; Andrews and Cutler, 1974). Typically, such scales are employed in an attempt to "objectify" the more abstract, subjective elements of our evaluations. At the other end of the continuum are those factors discussed above, such as LOC, LH, automaticity of changes, and naturalness of speech. At present, not only are these latter variables difficult, although not impossible, to assess, the precise relationship of these variables to treatment effectiveness is quite unclear. In general, factors within the "clearly effective" category have been more widely and objectively assessed, while those factors in the "unclear" category have been difficult to assess and have received fewer empirical evaluations, perhaps because few have considered them pertinent to the assessment of treatment efficacy.

Another potentially significant dimension in the consideration of the ways speech-language pathologists are effective is that of changes in *time* and *tension* of speech production (Conture, 1990). A change in *time* refers primarily to the person or speaker slowing down various aspects of one's speech and related behavior. This includes a variety of procedures, for example: (a) increasing pause time between words, (b) increasing duration of articulatory contacts, or (c) increasing duration of turn-taking or turn-switching pauses. A change in physical *tension* refers to: (a) bringing the physical tension level of speech and related musculature down to a level within normal limits; and (b) moving into and away from one speech target to the next in a smoother, less physically forced manner. As recently noted, changes in time and/or physical tension are central to most interventions designed to increase stutterers' speech fluency (Conture, in press).

HOW DO WE KNOW WE ARE EFFECTIVE?

The only two clear possibilities for evaluation of our "effectiveness" as speech-language pathologists are: (a) "external" validation, that is, validation by people other than the stutterer, for example, the speech-language pathologist or observers or listeners in the stutterers' environment; and (b) "internal" validation, that is, validation by the stutterer himself or herself. It should be noted, at the outset, that there may be some disparities between indices of listener's and speaker's judgments of treatment efficacy. For example, this disparity is evident in a recent study where stutterers rated their own speech naturalness (Ingham et al., 1989). The relatively stutter-free, treated stutterers were also required to self-rate changes in their speech naturalness. They did so with extremely high levels of intrajudge agreement, yet these changes in speech naturalness were undetectable by external listeners.

Validation by People Other Than the Stutterer—Observers/Listeners in the Environment

Such validation includes more or less subjective evaluations, for example, observers' overall impressions of the stutterer as a speaker, verbal reports from others, and so forth. The less subjective evaluations include paper and pencil documentation of perceptual observations of the stuttering behavior, as well as formal and informal testings before and after treatment. The most objective evaluations may involve perceptual ratings procedures based on repeated sampling of various aspects of the stuttering behavior (Zebrowski and Conture, 1989) (e.g., frequency of stuttering, duration of stuttering, or rate of utterance) or a variety of acoustic and speech production measures.

Acoustic measures may also be used to

measure stutterers' speech behavior in addition to listener or perceptual evaluations. Such acoustic measures include: a quantitative estimate of the duration of articulatory contact or cessation on a particular sound prolongation, the amount and duration of acoustically apparent noise or turbulence on a sound or syllable repetition, or the relation between stop gap and aspiration durations when making transitions from voiced to voiceless segments or vice versa (Zebrowski, Conture, and Cudahy, 1985). It would also appear fruitful to compare such acoustic measures to stutterers' self-perception of the same speech behavior. For example, Kelly and Conture (1988) used both acoustic and perceptual measures to assess adult stutterers' typical and imitated stutterings. Their finding of no significant relation between adult stutterers' self-perceived controlled and uncontrolled stutterings and the acoustic correlates of these speaking behaviors, strongly suggests that caution should be employed when using stutterers' self-reports as the sole or major means for judging treatment effectiveness.

Other objective speech production measures may be useful in determining (1) respiratory variables such as onset, duration, and pattern of speech breathing (e.g., "oppositional" versus "expiratory" patterns (Baken, McManus, and Cavallo, 1983); (2) phonatory variables such as degree and timing of glottal opening and closure per glottal cycle (e.g., Conture, Rothenberg, and Molitor, 1986); and (3) supraglottal articulatory variables such as degree of reciprocity of antagonistic articulatory musculature. Finally, these speech production measures may be used to quantify the integration and interaction of respiratory, phonatory, and articulatory levels of speech production (e.g., Conture, Colton, and Gleason, 1988; Caruso, Conture, and Colton, 1988).

VALIDATION BY THE STUTTERER

Although validation by the stutterer must necessarily be the most subjective type of evaluation, it may also be the most critical. Overall, as discussed earlier in this paper, one of our most important goals must surely be the stutterer's inner sense of control, appropriate self-perception, and personal responsibility for effecting and maintaining change.

The stutterer's own evaluation of effectiveness may include self-reports of: (a) willingness to interact with others, general social comfort, increased confidence in communicative as well as social situations, and increased willingness to initiate and/or maintain conversation; (b) reduced concerns, fears, and anxieties regarding social situations in general and/or specific communicative situations, for example, talking to strangers, speaking on the telephone, or conversing with a perceived authority figure; and (c) changes in attitudes and self-concept with regard to speech, which could be reflected in various aspects of the stutterer's life, personal feelings, family, and social interactions.

CONCLUSION

One of the primary difficulties in the evaluation of treatment effectiveness with stutterers would appear to relate to the problem of measurement in research on stuttering. In essence, although judges tend to agree on the overall number or frequency of stutterings that occur within a given sample, they exhibit less agreement on the specific speech events they identify or count as stutterings, and furthermore, often fail to clearly distinguish between normal dysfluencies and "mild" stutterings (Young, 1984, as cited in Ingham, 1989). These measurement difficulties are compounded by related concerns. First, some stuttering treatments have relied on clinicians making precise identification of stuttering events, a process that may be quite difficult to replicate both between and within clinicians. Second, total stuttering counts on a speech sample may differ depending on whether the counts were made using on-line (during conversation) or off-line (from a recorded sample of the conversation) evaluations. Third, and most importantly, researchers from different clinics or centers may differ dramatically on the total stuttering counts that they score on identical speech samples (Ingham, 1989). In Kully and Boberg's study (1988), the magnitude of most of these differences actually exceeded the amount or degree of changes in stuttering frequency that many therapy studies had attributed to successful treatment.

We urge further research in developing efficacy scales for assessment in the treatment of stuttering. Such research should address not only the readily quantifiable but also the less quantifiable (e.g., LOC) variables since the latter may impact significantly on the long-term efficacy of our intervention, particularly for adults who stutter. Stutterers' behavior influences their thinking and their thinking influences their behavior (Conture, 1990); neither exists in a vacuum and both must be considered when assessing long-term clinical efficacy. We are slowly but steadily increasing long-term effectiveness with stutterers, but as this paper points out, a number of issues need resolution before our effectiveness can be maximized with most stutterers, of all ages, in most situations.

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ARTICLE SEVEN

SELF-ASSESSMENT QUESTIONS

1. In adapting from Bloodstein's (1987) work, which "test" do we consider the most important in the evaluation of treatment efficacy?
   (a) Treatment should be equally effective in the hands of any clinician.
   (b) After treatment, the stutterer should be free from the necessity to monitor his or her own speech.
   (c) Results of treatment should carry over to situations outside of the clinic.
   (d) Results of treatment should be based on several adequate samples of speech.
2. Which of the following statements is *not* accurate given our clinical and research experience with stuttering?
   (a) Long-term follow-up studies of stuttering therapy would probably support the claims of many that 90% of their clients are "cured."
   (b) Almost anything that a clinician does, in which he or she and the client believe, will improve stuttering, at least temporarily.
   (c) Stuttering is a behavior that waxes and wanes in relatively unpredictable ways.
   (d) Change is a constant among stutterers.
3. Variables that are relatively easy to assess and have a relatively high degree of treatment efficacy (i.e., demonstrable change), according to our model of the hypothesized relationship between the variables, shown in Figure 1, do not include:
   (a) duration of stuttering
   (b) frequency of stuttering
   (c) locus of control
   (d) rate of utterance
4. Speech-language pathologists strive to be increasingly effective at all of the following, but especially:
   (a) helping stutterers become fluent in the clinic
   (b) helping stutterers achieve fluency most of the time

- (c) helping stutterers improve their attitudes towards speech
- (d) helping stutterers help themselves

5. Locus of control (LOC) refers to:
   - (a) an individual's perceived control over himself or herself and the environment
   - (b) naturalness of an individual's speech
   - (c) an individual's perceived control over another person
   - (d) an individual's "uncontrollability" or "learned helplessness"
6. Which of the following statements is *not* accurate in relation to the problem of measurement in stuttering therapy research?
   - (a) Judges frequently have difficulty in agreeing reliably on the occurrence of a specific instance of stuttering.
   - (b) Changes in attitudes towards speech and towards himself or herself as a speaker are easy to assess objectively.
   - (c) Judges frequently have difficulty in differentiating between normal dysfluencies and "mild" stutterings.
   - (d) Researchers from different clinics or centers may differ on the total stuttering counts that they score on identical speech samples.

INTERVENTION WITH SCHOOL-AGE STUTTERERS: A PARENT–CHILD FLUENCY GROUP APPROACH

Ellen M. Kelly, Ph.D., CCC-SLP[*] *and Edward G. Conture, Ph.D., CCC-SLP*[†]

TREATMENT OBJECTIVES

At present, there are no definite means for differentiating the child who will become a chronic stutterer from one encountering a temporary period of "normal" or even "abnormal" disfluencies. As a result, our ability to design treatment regimens tailored to the special needs of these two groups of children are not always as well developed as we would like. Thus, rather than ignoring the problem, waiting to see if it will "go away" on its own, we believe we should focus our energies on a) providing children with "tools" to assist them when they have difficulty communicating, and b) providing their parents with information, suggestions, and opportunities for interacting with their child who stutters in a manner that facilitates fluency. Through this approach, we try to effect changes in children's speech and nonspeech behaviors, including their attitudes and beliefs about speech as well as about themselves as individuals. In addition, by addressing childhood stuttering with in a parent–child (P-C) fluency group approach, we believe it is possible to help the children as well as their parents to understand that they are not alone in their attempts to confront this problem and that the child who stutters is, first and foremost, a child. As such, stuttering may be placed in proper perspective as only one facet of the total child.

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Many times, particularly with those children who have been stuttering for a brief period of time, our success is total; they "recover" completely. Perhaps their recovery was completely spontaneous (i.e., "they grew out of it"), or perhaps we essentially "cured" them. More likely, our intervention strategies lessened concerns on the part of these children and their parents (as well as ourselves), enabling all concerned to deal more constructively with the problem. For these children and their families, we feel our intervention techniques serve to decrease the duration and severity of the stuttering problem. Perhaps, these children are of no or low risk for developing chronic stuttering. Other children, however, may continue to stutter

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Note to Seminars Staff:
Please spell disfluency with "i" and one "s" (i.e., disfluency) ~~[illegible]~~ throughout. Thanks!!

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for an extended period, perhaps a lifetime. For these children and their families, our therapy serves to enhance their abilities to cope with stuttering behavior and related attitudes and feelings on a daily basis, for however long such services are needed.

How, then, do we determine whether our therapeutic efforts have been successful? It has been our experience that there are some young children who stutter who will probably never completely "recover." For these children and their families, success probably needs to be measured in a different manner than it is for those children whose stuttering is temporary. For children whose stuttering is transient we do not deem ourselves successful until the child has remained normally disfluent for a year or more. For those children who may always stutter to some degree, success is reflected in their own, and their parents', increasing independence and expressed confidence in dealing with stuttering. For these children, some form of therapy may always be a part of their lives, but should eventually include only those maintenance procedures deemed by the child, his parents, and the clinician as necessary for continued success.

THERAPEUTIC PROCEDURES

P-C Fluency Groups: General Considerations

We realize that some readers may be a bit concerned, as we were initially, by the thought of including parents in therapy programs for young children who stutter. Such concern may arise for a variety of reasons. First, including parents in therapy sessions requires additional time, space, and preparation on the part of the speech-language clinician. Second, parents bring their own needs, concerns, ideas, opinions, and personalities to therapy, requiring us to deal with much more than just the child who stutters. Third, some parents may be reluctant to participate in therapy, expressing directly or indirectly their opinion that "You're the professional, you cure him." These and other considerations may make P-C therapy a somewhat foreboding task at the outset. We have found, however, that once one gets past the initial concerns and logistical difficulties of the P-C group, the benefits of successful, more expedient and comprehensive therapy far outweigh the costs. If complete implementation of a P-C fluency group approach is not possible, we suggest selection and utilization of these aspects of this approach that appear most applicable to your particular clients and therapeutic setting.

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Rationale

It is currently the belief of many researchers, theorists, and clinicians that stuttering results from a complex interaction among a multiplicity of constitutional and environmental factors.[1-4] It seems logical, therefore, the effective diagnosis and treatment of stuttering should include attention to as many of these factors as possible. During the assessment of stuttering in young children, aspects of the child's speech, language, motor, social, and emotional development are typically compared with age-level expectations. In addition, the role of environmental factors, typically parent–child interactions, and their relation to the child and his stuttering are explored. Specifically, parental attitudes and behaviors are assessed through interviews and observed interactions with their children. It is the belief of many clinicians, including ourselves, that improvements in children's fluency are correlated, at least in part, with changes in the communicative interactions between themselves and their parents.[2,5-7] It is frequently suggested, therefore, that parents make changes in the home environment as well as in their own behavior in order to facilitate maximally their child's speech fluency.[5-11] For example, Johnson[12,13] advised parents "... to be good listeners, to understand the sequences of language and speech development, and not to be overly demanding of the child's linguistic skills"[9] (p. 151). Riley and Riley[10] also emphasized the importance of communi-

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after parent counseling. For those whose stuttering occurs frequently and regularly, accompanied by tension, struggle, parental concern, and potential concern on the part of the child, therapy is typically initiated. However, as previously mentioned, it is not always easy to make these differential diagnostic decisions, particularly for those children who occupy the "middle ground" between normal fluency and stuttering. Diagnostically, these children are usually found to exhibit from 3% to 7% within-word disfluencies, little or no associated speech and nonspeech behavior, and no apparent concern with, or awareness of, their speech disfluencies. We typically view these children as "low" risk for stuttering and evaluate them one or more additional times before therapy is initiated. Through reevaluations, we can monitor the child's stuttering and related behaviors while maintaining contact with the parents. For some of these children a few suggestions for home implementation result in alleviation of the problem without necessitating therapy[2,35] (see Table 1). For those children who continue to exhibit stuttering over the course of one to three follow-up evaluations (3 to 6 months apart), however, therapy is often recommended.

Scheduling Therapy

Most of the elementary school children and parents we see participate in two successive 10- to 12-week blocks of twice-weekly, 60-minute therapy sessions after school. Some require only one block; others require three to six or more blocks of therapy. One of the two sessions per week includes guided parental observation of their children from behind a two-way mirror when this is appropriate to therapeutic goals. During the other 60-minute session per week, parents meet in a group with a clinician, while the children meet in a separate group. This allows for extensive, adult-level discussion within the parent group and enhanced practice for the children within their peer group. Parents also participate in selected portions of the child's group to facilitate acquisition of fluency-facilitating skills by both the children and their parents for carryover outside of the clinic setting. If twice-weekly sessions are not possible, the parent group can be conducted simultaneously with the child's group, in separate rooms, 1 day per week.

THE CHILDREN'S GROUP

Children are placed in a group with two to five other age-matched children. Each 60-minute session usually involves two clinicians, one acting as group leader and the other assisting by demonstrating skills and activities, monitoring responses, and providing additional reinforcement (however, one clinician can perform both tasks). The children are typically seated at a table with their names affixed to the

TABLE 1. Suggestions Typically Given to Parents for Facilitating their Youngsters' Fluency at Home

1. Let your child know through verbal (e.g., "I'm listening.") and nonverbal (e.g., by maintaining eye contact) means that you are paying a reasonable amount of attention to him and to what he has to say.
2. Help your child to learn how to speak more slowly by using a slower rate of speech yourself.
3. Wait for your child to finish his speaking turn before you begin to speak, pausing for one to two seconds before you begin your turn.
4. Keep your own sentences short and to the point when your child is more capable of producing fluently at his or her own level of development.
5. Comfort your child verbally when he is visibly frustrated with his inability to speak fluently and easily (e.g., "I know it's really hard sometimes, but it's okay. I'm here and I'm listening."). Gentle pats on the arm or shoulder, and hugs that assure the child of your love, will also help at this time.
6. Encourage others in the environment (e.g., siblings, grandparents) to refrain from interrupting the child, negatively evaluating his/her stuttering, or rushing him/her to speak more quickly. Using your speech as a model, some of these people may also be willing and able to slow their own speech rates, lengthen their turn-switching pauses, and give the child as much attention as possible when they speak to him.
7. Spend five to ten minutes each day talking one-to-one with your child, using a slow rate of speech, pausing before you begin to speak, and giving the child a reasonable amount of your attention.

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dren learn to identify and produce different types of "hard" speech by giving these different speech behaviors names or labels that are relatively concrete, seem to have meaning for the children, and make the concepts easier to remember. For example, one group of children developed the following terms for their "hard" or stuttered speech:

1. "Big Bumps" = Whole-word repetitions (e.g., "but-but")
2. "Little Bumps" = Sound/syllable repetitions (e.g., "sh-she")
3. "Skidding" = Audible sound prolongations (e.g., "mmmmy")
4. "Getting Stuck" = Inaudible sound prolongations (e.g., ". . . what").

Using a race track, they set up obstacles and maneuvered vehicles over the track. The obstacles included sets of widely spaced ("big bumps") and closely spaced ("little bumps") railroad ties, bridges (for "skidding"), and gates that could be raised and lowered ("getting stuck"). Using single words, then phrases, then sentences, children drove over the course, demonstrating the disfluency type associated with each particular obstacle and then backing up and approaching the obstacle again using "smooth" or fluent speech. Later, children learn to identify the type of obstacles encountered in their running speech without utilizing the race track. At first, they "back up" and produce the stuttered word fluently. Then, with time, they anticipate problems and "head them off at the pass" by modifying their speech behavior as "trouble approaches." Eventually, most children are able to "head trouble off at the pass" spontaneously during conversational speech, or, when necessary, "back up" and produce the stuttered word in a more fluent manner.

Activities are carried out in a carefully controlled social–communicative atmosphere in which clinicians provide facilitative speech models. Throughout these sessions, the clinicians utilize slow normal speaking rates (i.e., 130–150 wpm) and reduced levels of physical tension during their own speech production. Clinicians also modify the number and nature of activities depending on the children's frequency and nature of stutterings, variations in rate, language levels, phonologic abilities, enjoyment of the activities, and demonstration of other associated speech and nonspeech behaviors. In this context, it is important for clinicians to model the speech behavior that they want the children to do. Demonstrating is far better than explaining; that is, clinicians should attempt to *show* rather than *tell* the children what to do.[2,29,31]

produce.

Children who continue to stutter after two successive blocks of twice-weekly P-C fluency therapy will most likely require some period of individual therapy. For children who seem to have benefited from the group but need additional practice, we recommend P-C group once per week and individual therapy once per week. For those children whose stuttering appears minimally affected following several blocks (10- to 12-week periods) of the P-C group, twice-weekly individual therapy may be recommended. Some of these children may be experiencing parental environments that are psychosocially unstable and/or inhibitory to the development of fluent speech, but this occurs infrequently. In our experience, most children who do not readily respond to P-C fluency group therapy are those who have concomitant speech–language difficulties or who have attitudes about their speech and themselves that interfere with their ability to participate fully in the group and in carryover activities at home. For example, the child who is unable or unwilling to learn to use longer turn-switching pauses often begins to talk before he or she knows what the other person has said, and therefore, how to respond. Consequently, the child is apt to continue to exhibit utterance-initial stutterings, as he or she struggles to respond appropriately.

Attitudes about Speech and Self

Within the P-C group, children are encouraged to talk openly and freely about their speech and about themselves. Clini-

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cians emphasize the fact that each of us is different as well as special. If one or more children show evidence of being discouraged or disheartened because of their stuttering, efforts are made to help them to deal with these feelings. Some children may be overly sensitive to changes in the therapy routine. Others may show frustration with any imperfections in themselves, whether related to speech or not. For these children, clinicians routinely discuss the notion that "everyone makes mistakes" and that "it's okay" to do so. One clinician may purposefully (or not so purposefully) make a mistake in an activity or while speaking, showing frustration. The other clinician then reassures him or her, emphasizing that "it's okay to make mistakes" and that "no one is perfect." Quite often the children join in, reassuring the "error-maker" and saying, "sometimes I make mistakes too." The next time the child with perfectionistic tendencies becomes discouraged, the group is better able to respond positively and in a facilitative manner. In our experience, while not eliminating such problems entirely, the child gradually becomes much more tolerant of his own as well as others' mistakes.

THE PARENTS' GROUP

One important aspect of therapy is communication, both with the child and with his parents. This must be addressed on both verbal and nonverbal levels through discussion, instruction, listening, and watching.[10,11,20,35,36] The process of change in attitudes and beliefs about speaking, as well as in speech behavior itself, is an active rather than a passive process. If it is considered as an active process, then, in our opinion, therapy has the highest possibility of having a long-term positive influence on children who stutter and their families. When we communicate with the parents of stutterers, however, it is important to avoid a) increasing the considerable guilt they all-too-often feel about their role in their child's problem, b) giving them the impression, through word or deed, that they are being blamed for causing the problem, or c) inadvertently browbeating them or forcibly persuading them to think as we do. It is our impression that a parent "convinced against his or her will remains of the same mind still," to paraphrase an old saying.

Beginning with the initial diagnostic, we discuss our findings, recommendations, and general therapeutic approaches and beliefs with parents, in as much detail as needed. It has become clear to us, through repeated contact with parents, that uninformed parents are highly resistant to changing their own behaviors. This stems not from an unwillingness to help their children, but from a lack of knowledge and understanding of, and thus confidence in, the clinician as well as the therapeutic process. We have found that parents need to be clearly, but patiently, informed of our belief that they did not cause their child's stuttering. We explain that stuttering is most likely related to a complex interaction between the child's environment and the skills and abilities the child brings to that environment.[2,34]

The speech–language clinician needs to convey a variety of important pieces of information to parents using a manner and level of vocabulary to which the particular parent(s) can readily relate, as well as understand.[6,40]* Initially, we discuss our belief that children's fluency, as well as other aspects of communication (e.g., phonology and language) can and will continue to change and develop with maturation. However, rather than adopting a "wait and see" attitude, parents are advised that there are many things they can do *now* to facilitate their child's fluency. During parental interactions, it is recommended that the clinician continually gauge the amount and extent of information they can realistically share with parents at each contact. This requires careful observational skills and the ability to a) listen to what the parents are saying (and/or not

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*Conture and Fraser 30 is one of several publications[6,39] that can be shared with parents to increase their understanding of their child's stuttering.

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saying), b) present the information in an appropriate manner, and/or c) repeat it several times, in several different ways, until communication appears to have been achieved.

We have also found from experience that, "a picture is worth a thousand words." As mentioned earlier in relation to the children, when behavior change is desired, it is better to show or demonstrate to the parents what we want them to do rather than to tell them what to do by bombarding them with lengthy or detailed verbal explanations or lectures. This may be accomplished within the parent group, during parental observations of the children's group, and during activities incorporating parents, children, and the clinicians.

GENERAL OBJECTIVES OF THE PARENTS' GROUP

Three interrelated procedures are used with parents to help them learn about and change their own and their children's communicative behaviors:

1. counseling and information sharing
2. guided observations of the children in interaction with the clinicians
3. guided participation in therapy with the children and clinicians.

Counseling Parents in a Group

By bringing parents together in a group of three to six adults, many different but related functions may be accomplished. These include the following:

1. *Feeling alone, coming together.* Through the group parents discover, by meeting and talking with other parents who have children who stutter, that they are "not alone." Our experience indicates that it is helpful and comforting for parents to realize that they are not isolated in their attempts to deal with their child and his or her problem. Often, confirmation of one parent's fears and frustrations by another parent with similar concerns brings relief and puts the child's problem into perspective. It is also our experience that such relief and perspective-taking is accomplished much faster parent-to-parent than through our own empathic responses as clinicians.

2. *Understanding children, understanding speech.* Through the group, parents are provided with objective information about children in general, speech and language development, and stuttering in particular. Before many parents learn what they can do to help, they must "unlearn" information that has little factual or empirical support. Such information may have been obtained from other professionals, friends, relatives, or created on their own. Clinicians may use the parent group as a forum to combat misinformation or rumors regarding the nature, cause, and course of stuttering in children.

3. *Common concerns, unique concerns.* Through the group experience, parents come to appreciate better those concerns that all or most parents have in common, as well as those that are of concern only to an individual parent or parents. The clinician should try to point out the similarities among children as well as highlight, whenever possible, each child's unique abilities and nature. Parents seem to benefit greatly from learning about the successes and failures reported by other parents. Parents frequently find that changes in their own behavior that seem particularly difficult (e.g., slowing their speaking rate) are also difficult for other parents but may be accomplished with repeated practice.

4. *Modifying your speech, facilitating your child's speech.* Last, but certainly not least, through the group, parents learn to identify and begin to a) modify aspects of their own speech and related behavior[b] that inhibit their children's fluency, and b) attempt to do more things, more often, that will foster their children's fluency.

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[b] Parental speaking behaviors that appear to inhibit a child's fluent speaking behavior are excessively rapid speaking rate, frequent use of long, complex utterances, and frequent interruptions of the child while the child is talking. Other parental behaviors that may also inhibit a child's production of normally disfluent speech are frequent and excessive demands for perfect performance, frequent and excessive overreactions to changes in family routine, and so forth.

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Guided Observation of the Children

One of the two 60-minute weekly therapy sessions includes clinician-guided parental observation of the children's group. Parents are seated in an adjacent room with a two-way mirror or television monitor for observing the child's group. Before the session begins, the clinicians give the parents verbal and sometimes written information regarding the goals of the children's group for that particular day. Parents are instructed to look and listen for specific behaviors of the children and clinicians during the therapy session. If possible, one additional clinician (e.g., a clinical supervisor) remains with the parents in order to highlight relevant aspects of the therapy sessions, such as slow speaking rates (i.e., 130–150 wpm), longer turn-switching pauses (i.e., 1 to 3 seconds), modified expressive language use (depending on the activity), and the children's responses to these models. Near the end of the sessions, this clinician can also make general comments regarding the day's events and respond to any questions the parents may raise. Parents are cautioned against having unrealistic expectations that their child will quickly and easily transfer the behaviors demonstrated in therapy to the outside world, particularly during early stages of therapy. For example, parents are told that the children's use of a slow speech rate in the structured therapy environment may not indicate the child's readiness to use that rate in everyday situations. Parents are informed that the manner in which they speak to their child (i.e., the length and complexity of their utterances, their speech rates, turn-switching pauses, etc. may affect their child's fluency and/or ability to transfer behavior learned in therapy to external environments. Early in therapy, parents are asked to observe their own speech behaviors in interactions with their children at home between sessions. They are also asked to be prepared to discuss these behaviors at upcoming sessions of the parent group. When they appear to be ready, parents are asked to begin to change these behaviors at home during daily interactions (5 to 10 minutes per interaction) with their child.

Guided Participation in Therapy

Once the parents have become familiar with the methods and procedures as well as the principles on which the children's therapy is based, they are asked to participate in the children's group. Inclusion of the parents may begin as early as the second week of therapy if all parents and children have participated in the group before, and typically by the fourth week, if not. At first we have the parents join the children at the end of each therapy session, during the final activity. During the first few sessions the parents are asked simply to sit with their children, making neutral and/or positive comments about the activity and helping the children as they wish. Before their involvement in the children's group, parents are reminded to use a slow rate of speech and appropriate turn-taking behaviors when they are in the therapy setting with their children. Parental speech and related behaviors during the first few sessions with the children are discussed at subsequent parent group meetings. At that time, parents are asked to comment about their children's behavior, their feelings about participation, and their own behaviors during the sessions.

During subsequent weeks, as the parents demonstrate improved abilities to modify their own speech production behaviors and pragmatic skills (e.g., maintaining appropriate amounts of eye contact, waiting their turn, listening attentively, etc.), they participate in an increasing number of activities with the children and clinicians. For example, parents may modify their own speaking rates and turn-switching pauses during activities in which the children are practicing "easy, medium" speech. Popular tasks for these parent–child group interactions include a) concentrationlike activities, b) "grandmother's trunk," in which participants must build on a list of alphabetically ordered items produced along with a carrier phrase, c) charades, in which partici-

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pants try to determine the item or character a child or parent attempts to demonstrate, and d) scavenger hunts, during which parents and their children present the items they find to the entire group after the hunt. Throughout these activities, clinicians are responsible for providing instructions, communicative models, and for reinforcing the parents and children for appropriate speech and related behaviors. The children are provided with workbooks containing a variety of activities in which parents and children can participate at home. These range from puzzles and board games to discussion topics (e.g., Draw a picture of what you would invent if you could invent anything in the world. Then talk about it with Mom and/or Dad). Clinicians discuss with the parents and children that they must make every attempt to use "easy, medium" speech during these activities and not interrupt one another. Each week, the previous week's homework activities are discussed and new tasks assigned.

It has been our experience that many parents are initially reluctant to enter into this part of therapy, feeling that they will be under scrutiny or "on the spot" regarding their interactions with their children. Once involved, comfortable, and firmly but gently encouraged by the clinician, parents seem to enjoy the experience and comment that it has been particularly beneficial for them and their children. Parents also tend to express increased confidence in their abilities to modify their own communicative behaviors. As a result of this aspect of P-C therapy, we have observed more positive, fluency-facilitating interactions between parents and children within the group setting that are reported to carry over to situations outside of the therapy setting.

LONG-TERM RESULTS OBTAINED

One way to examine therapeutic successes and failures is to identify and describe subgroups of young stuttering children who are differentiated on the basis of their response to our therapeutic strategies.

Children who Quickly and Fully Recover

The children who make up the first group, having recovered from stuttering after one to two blocks in the P-C group, comprise roughly 50% of the preschool and early elementary school-age children we work with. These children respond relatively quickly to modifications in the communicative behaviors of the clinicians and their parents. By learning a few fairly simple communicative strategies (e.g., longer turn-taking pauses and a slower rate of speaking), these children produce normally dysfluent speech in most situations. After a period of time (3 months to a year), these children are normally dysfluent, with no further concerns regarding stuttering. This group of children may include those who go through a period of stuttering as their speech, language, motor, and psychosocial skills are developing. They may experience a demands-capacities gap, as described by Starkweather,[1] characterized by a mismatch between their developing communication capacities and the demands placed on them by the environment and by their use of still-developing speech, language, motor, and psychosocial skills.

Children who Recover, but not as Quickly

The second subgroup ~~described~~ recover from stuttering after several blocks of the P-C group and several blocks of group plus individual therapy. These children make up about 25% of the children we see. Typically, there are difficulties in addition to fluency that tend to exacerbate the problem. These may include a) an environment that appears to tax their communicative abilities, b) concomitant phonologic and/or language difficulties, c) attention deficit disorders and/or learning disabilities, d) slow-to-develop neuromotor systems, and/or e) difficulties in making appropriate psychosocial adjustments, among others. For these children, we could say the gap between demands and capacities is even wider, necessitating a longer period of therapy, including individual attention to any other problems concomitant with stuttering. Given time, therapy, and a facilitative home environment, these children also eventually recover from stuttering.

Children who do not Fully Recover, but Stutter Less

The third group ~~we described~~ continues to stutter, but with less frequency and severity and greater control after participation in group as well as individual therapy. These children comprise about 15% of the children we see and may have a stuttering problem that is not simply developmental in nature. In fact, without treatment, these children may continue to stutter for a long period of time, if not a lifetime. Through the P-C group and individual therapy, these children gain excellent control of their stuttering. Their abilities to utilize communicative strategies to address both the time and physical tension aspects of speech that relate to stuttering are enhanced by including parents and others in the environment who can serve as fluency facilitators for the child in therapy. By learning and practicing skills within the therapy setting and then gaining additional practice and support at home, these children slowly develop more confidence as well as the skills necessary to control their stuttering in most, if not all, speaking situations. In addition, by addressing attitudes about speech and self within the context of P-C therapy, these children come to see themselves as persons, first and foremost. For them, stuttering becomes a smaller part of their total selves that requires attention and practice. Much like a diabetic takes responsibility for his or her treatment regimen, these children learn to exercise some degree of control over their stuttering.

Children who Fail to Recover or Lessen their Stuttering

About 10% of the children we see neither recover nor improve their speech fluency. These children have typically participated in some combination of P-C group and individual therapy, but are often no longer in therapy, having withdrawn or been dismissed due to lack of progress. Their lack of progress is not infrequently due to chronic absenteeism and/or lack of motivation on the part of the child and/or his parents to deal with the stuttering and related behavior. Some of these children and their parents, while cooperating fully during therapy sessions, appear to do little or nothing at home to address their speaking concerns. Others are listless and inattentive during therapy, arrive late continually, or fail to attend many of the sessions. For these children, parents will sometimes report that they have to "drag" the child to therapy (this is ~~contrast to~~ not the case for most youngsters, who enjoy the P-C group, look forward to attending, and are reluctant to leave at the end of therapy sessions). Obviously, when these problems occur, therapy has little hope for benefiting the child and may do more harm than good to the parent-child relationship. When this occurs, we typically dismiss the child from therapy (sometimes after only two to four sessions), scheduling a follow-up evaluation within 6 months of the dismissal date. We also try to discuss the child's present status with him or her and make it clear that we will be available in the future, should he or she decide to seek our assistance. In addition, we inform the parents of the lack of progress, the child's current status, and options for the future. Even if we seem to be "closing the door" on a temporary basis, we try to leave it "open a crack" to allow the child and his or her parents to come in at a later date and reevaluate the problem. It is our experience that lack of motivation, for at least some of these children, may be temporary.

Some Possible Reasons for Lack of Motivation to Change

There are obviously many different reasons for lack of motivation on the part of children and their parents. A child and/or his or her parents may feel overwhelmed by other responsibilities or family crises, making the child's stuttering a fairly low priority in their lives. Or, they may not feel that stuttering is detrimental to the child's social and/or academic life at a particular time. When this occurs, there seems to be little we can say that will make a real difference. On occasion, we have experienced tremendous resistance from parents or children when we have tried to convince them, against their expressed feelings to the contrary, that therapy is an immediate necessity. Quite often, if we provide them with the facts about the child's stuttering and "leave the door open" for the future, they will return, ready to take the steps necessary to deal with the stuttering and related concerns in an effective manner. Perhaps we should also be prepared to welcome the attitude on the part of the child who stutters that "I stutter, but it doesn't bother me. I can live with it as it is." After all, if it is not a problem for the person who stutters, is it a problem for anyone?! As clinicians who want to help, this is often difficult to accept and even harder for parents to accept if they are not of the same mind. Given that a) we will make little headway when the child is clearly unmotivated to change, and b) the child seems to have a positive attitude about the place of stuttering in his life, however, we may have to "just let go" of some of these children, at least for the time being.

As one would expect, participation of the parents in the P-C group is also crucial in terms of motivation. For the speech–language clinician, transfer and carryover are among the more crucial long-term determinants of therapeutic success. When we have parents who are interested, motivated, and dedicated to therapy, we have found our therapy to be extremely successful. As we have developed and implemented the P-C fluency group approach, the involvement of parents has made a significant difference, particularly when such involvement is active and ongoing. With some parental "willing suspense of disbelief" at the beginning of therapy, as well as dedication on the part of clinicians and patience on the part of parents during therapy, the eventual outcome with these children and their families can be "well worth the wait"!

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ARTICLE FIVE

SELF-ASSESSMENT QUESTIONS

1. What should you avoid when counseling the parents of children who stutter?
   (a) telling them what clinical research has revealed regarding the problem of stuttering
   (b) sharing your own experiences with children who stutter
   (c) making them feel that they caused their child's stuttering
   (d) answering any questions about the child that do not specifically relate to his or her stuttering
   (e) telling them how their child is doing in therapy
2. A typical reason for lack of motivation on the part of a child who stutters is:
   (a) absence of a stuttering problem
   (b) the child's feeling that his or her stuttering is not a significant problem in his or her life
   (c) concern that the stuttering will never go away
   (d) experiencing enhanced fluency within the therapy setting
   (e) having input into the selection of transfer activities
3. Children may not improve in therapy due to:
   (a) the cyclical nature of stuttering
   (b) parental support and encouragement
   (c) frequent attendance by the child and his or her parents
   (d) absence of a stuttering problem
   (e) a home environment that continuously taxes the child's abilities to speak fluently
4. When demonstrating a technique to parents or children, it is best to:
   (a) give lengthy explanations of the technique
   (b) have the child and/or parents try it out on their own first
   (c) give explicit directions several times
   (d) show or model the technique rather than telling the child or parent how to do it
   (e) send home descriptions of the activities they will be participating in during the next session
5. Including parents in the therapy sessions with their children helps to:
   (a) maximize demonstration and practice of techniques the parents and children will be using at home
   (b) make both parents and children extremely uncomfortable about stuttering so that they will start to make changes
   (c) make it clear to the parents that changing communicative interactions is difficult
   (d) give the parents an idea of how to be speech–language pathologists
   (e) impress upon parents the importance of correcting their child's mistakes and disfluencies

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Comorbidity of stuttering and disordered phonology in young children.
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Comorbidity of Stuttering and Disordered Phonology in Young Children

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ABSTRACT

Young stutterers frequently exhibit concomitant speech and/or language disorders. The co-occurrence of these disorders is, however, not yet well understood. The purpose of this paper is to introduce the notion of "comorbidity" as it relates to the field of speech-language pathology; specifically, to discuss comorbidity (coexistence) of stuttering and disordered phonology in young children. Literature on concomitant speech and language disorders in young stutterers is reviewed, with special reference to the prevalence of articulatory/phonological disorders in young stutterers. Future research on the coexistence of two speech and language disorders is encouraged, as well as the consideration of diagnostic treatment and prognostic implications for children who exhibit both stuttering and disordered phonology as opposed to children who exhibit each disorder in isolation.

OPSOMMING

Jong hakkelaars vertoon dikwels samegaande spraak- en/of taalafwykings. Die gelyktydige voorkoms van hierdie afwykings word tans egter nie ten volle begryp nie. Die doel van hierdie artikel is om die begrip van "ko-morbiditeit" bekend te stel soos wat dit toegepas word op die vakgebied van spraakheelkunde en ook spesifiek om die gelyktydige voorkoms van hakkel en fonologiese afwykings in jong kinders te bespreek. 'n Literatuuroorsig van die gelyktydige voorkoms van spraak- en taalafwykings in jong hakkelaars word verskaf, met spesiale verwysing na die voorkoms van artikulasie/fonologiese afwykings in jong hakkelaars. Verdere navorsing oor die gelyktydige voorkoms van twee spraak- en taalafwykings word aangemoedig. Die oorweging van diagnostiese, behandelings en prognostiese implikasies vir kinders wat beide hakkel en afwykende fonologiese ontwikkeling vertoon, in teenstelling met kinders wat elke afwyking afsonderlik vertoon, word aangebied.

Comorbidity refers to "... any distinct additional clinical entity that has existed or that may occur during the clinical course of a patient who has the index disease under study" (Feinstein, 1970, p. 456). Comorbidity has been discussed in some detail in the medical literature, particularly in relation to psychiatric disorders (Boyd, Burke, Gruenberg, Holzer, Rae, George, Karno, Stoltzman, McEvoy & Nestadt, 1984; Feinstein, 1970). Yet it has received little attention in the field of speech-language pathology. Although children with more than one speech disorder (e.g., stuttering and disordered phonology) are encountered frequently in clinical practice, there has been a paucity of research dedicated to understanding the coexistence and inter-relationships between two speech disorders. Indeed, Stuttering (S) and Disordered Phonology (DP) have traditionally been investigated and treated as two distinct disorders. Little attempt has been made to merge the two disorders in terms of the following: (1) investigation of their co-occurrence in some children; (2) therapy regimens when both disorders are exhibited in the same child; and (3) conceptual explanations for their co-existence, and in some cases, persistence.

The general purpose of this paper is to introduce the notion of "comorbidity" as it relates to the field of speech-language pathology. The more specific aim is to discuss the comorbidity (co-existence) of stuttering and disordered phonology exhibited in young children. Literature on concomitant speech and language disorders in young stutterers is reviewed, with special reference to the prevalence of articulatory/phonological disorders in young stutterers.

Understanding the coexistence of two speech disorders in particular, Stuttering (S) and Disordered Phonology (DP), has clinical implications, for example, differential diagnosis, such as the possibility of behavioral subgroups of young stutterers. Further, diagnostic treatment and prognostic features may be different for children who exhibit the co-occurrence of two speech disorders as opposed to each disorder in isolation. Feinstein (1970, p. 456) states: "With comorbidity omitted from consideration, two clinicians arguing about the merits of a mode of treatment for a particular disease may fail to recognize that their contradictory results arise not from the actions of treatment, but from the different associated diseases in the patients subjected to treatment."

Regarding the co-occurrence of stuttering and disordered phonology in young children, several studies have investigated the prevalence of their coexistence (e.g., Blood & Seider, 1981; Daly, 1981). These studies are presented and discussed in detail below. In general, findings from previous studies have shown that 30-40% of young stutterers also exhibit articulation/phonological concerns (see Table 1 below). However, only a few studies have attempted to explore the nature of this co-occurrence in more depth (e.g., St. Louis &

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Hinzman, 1988; Louko, Conture & Edwards, 1990). Thus, little objective information is available regarding the nature and relation of these two disorders in young children. Because it appears that approximately *one third* of children who stutter at one time or another exhibit articulation difficulties (e.g., Cantwell & Baker, 1985), it would seem important to increase our understanding of the nature and relation between stuttering and articulatory/phonological disorders in young children.

To further highlight the existence and clinical importance of the co-occurrence of these two disorders, it is noted that clinicians frequently report that young children who are being treated for articulation difficulties may subsequently begin to stutter. Comas (1974, cited in Bloodstein, 1987, p. 221) reported that out of 1,050 cases of young children, in some, stuttering was observed to appear while they were being treated for articulation difficulties. In addition, with reference to child-

Table 1: Published Studies on the Co-occurrence of Stuttering and Articulation/Phonological Difficulties in Young Children

		N			%	%	
Author	Date	Stut.	Nonstut.	Source of Information	Stut. with Artic. Diff.	Nonstut. with Artic. Diff.	Summary of Findings
1. McDowell	(1928)	33	33	Speech Exam. (Articulation Test)	19%	16%	articulation difficulties with significant difference between groups
2. Schindler	(1955)	126	252	Speech Exam.	49%	15%	"other speech disorders"
3. Darley	(1955)	50	50	Parental Reports	26%	4%	associated articulation difficulties
4. Morley	(1957)	37	113	Speech Exam	50%	31%	"other speech disorders"
5. Andrews and Harris	(1964)	77	78	Parental Reports	30%	10%	associated articulation difficulties
6. Williams and Silverman	(1968)	115	115	Speech Exam	24%	9%	associated articulation difficulties
7. Van Riper	(1971)	250-300	–	Clinical Records	14-25%	–	Delayed speech and language, articulation difficulties or evidence of organic involvement (TRACK II STUTTERERS)
8. Riley and Riley	(1979)	100	–	Speech Exam	33%	–	associated articulation difficuties
9. Preus	(1981)	100	–	Clinical Records	18%	–	Van Riper's Track II Stutterers
10. Daly	(1981)	138	–	Speech Exam.	58%	–	articulation disorders
11. Blood and Seider	(1981)	1060	–	Clinical Reports	16%	–	articulation difficulties
12. Seider, Gladstein and Kidd	(1982)	201	201 (Siblings)	Parental Reports	–	–	no significant difference between groups
13. Thompson	(1983)	48	–	Speech Exam.	35-45%	–	"suspected articulation difficulties"
14. Cantwell and Baker	(1985)	40	–	Speech Exam	30%	–	–
15. St. Louis and Hinzman	(1988)	48	24	Speech Exam.	67-96%	–	–
16. Louko, Edwards and Conture	(1990)	30	30	Speech Exam.	40%	7%	associated articulation difficulties

ren treated for language disorders, Merits-Patterson & Reed (1981) recently showed that speech disfluencies can increase for some children who receive speech/language therapy. They investigated 27 preschool children classified into 3 groups of 9 each: language delayed children who had received language therapy, language delayed children who had not received therapy, and those children with normal language development. None of the 27 children had ever been diagnosed as stutterers. They found that the group of language delayed children who received therapy produced significantly more whole-word and part-word repetitions (after therapy) than the other two groups.

Although there have been few published reports on the influence of therapy on other aspects of young stutterers' speech and language apart from the studies by Comas (1974; cited in Bloodstein, 1987), and Merits-Patterson & Reed (1981), clinical reports suggest that stuttering often occurs secondary to the treatment of phonological and language disorders in young children; but, to our knowledge, the reverse has never been reported.

CONCOMITANT SPEECH AND LANGUAGE DISORDERS IN YOUNG STUTTERERS

PREVALENCE OF ARTICULATORY/PHONOLOGICAL DISORDERS IN YOUNG STUTTERERS

A review of studies from 1928-1990 is presented in Table 1. For each study, the author(s), date, sample size, source of information, percent stutterers and nonstutterers with articulation disorders, and major findings are summarized. "Major findings" refers to the major characteristics pertaining to the stutterers for that study.

The first of these studies was conducted by McDowell (1928). He matched 33 stutterers and 33 nonstutterers according to age, sex, intelligence, native language and racial background. For both groups, the mean age was 10 years (range = 7-12 years). A nonstandardized articulation test was used, in which each child was required to repeat a series of sentences after an examiner, who recorded errors in the production of vowels, diphthongs, consonants and consonant clusters. Findings indicated that the mean error rates for the stutterers and nonstutterers were 19% and 16%, respectively. This represented a small but statistically significant difference between the two groups. McDowell questioned the validity of these findings, however, because subjective scoring procedures were employed. Moreover, it could be argued that repetition of sounds in sentences is a different form of speech elicitation than a naming task or conversational speech, since an imitation task may overestimate the child's performance.

Subsequent studies in the 1950's made reference to the presence of "other speech disorders" in young stutterers, with only vague suggestion that these "other disorders" were most likely to be articulation difficulties (Morley, 1957; Schindler, 1955). For example, Schindler (1955) found that 49% of 126 stuttering children had "other" speech disorders, whilst this was evident in only 15% of 252 nonstutterers. Similarly, Morley (1957) reported that 50% of 37 young stutterers and 31% of 113 nonstutterers had "other speech disorders". It is difficult to determine from these early studies exactly what was implied by "other speech disorders". However, it is assumed that many of these were difficulties with speech sound production.

More recent studies have reported specifically on the prevalence of articulation difficulties in young stutterers. Williams & Silverman (1968) found 24% of 115 school-aged stutterers had associated articulation difficulties. Riley & Riley (1979) showed this to be the case in 33% of 100 young stutterers. Daly (1981) reported that 58% of a subgroup of 25 young stutterers (n = 25), out of a larger sample (N = 138), exhibited articulation disorders. Thompson (1983) observed a 35-45% prevalence of suspected articulation difficulties in two samples (N = 31 & N = 17) of young stutterers. Recently, Cantwell & Baker (1985) reported a prevalence of approximately 30% in a sample of 40 young stutterers out of a larger sample of 600 children with speech and/or language disorders. St. Louis & Hinzman (1988) found that 67-96% of their school-aged stutterers (N = 48) had articulation difficulties. In general, they found that young stutterers are likely to manifest other communicative impairments, especially in articulation and voice.

Further, several studies have indicated a prevalence of 15-30% articulation difficulties in young stutterers based on clinical and/or parental reports (e.g., Andrews & Harris, 1964; Darley, 1955). Van Riper (1971), using clinical records and related observations, reported that 14-25% of young stutterers had "delayed speech and language, articulation difficulties or evidence of organic involvement". He categorized these as "Track II" stutterers. Preus (1981) studied the clinical records of 100 young Norwegian stutterers, and reported that 18% had similar difficulties and could be classified as Van Riper's "Track II" stutterers.

Blood & Seider (1981) found that, among caseload reports of 1,060 young stutterers, 16% exhibited articulation difficulties. However, it is difficult to interpret this result meaningfully because Blood & Seider did not employ a control group of nonstutterers. Furthermore, the criteria used in diagnosing articulation difficulties varied among clinicians (cf. Nippold, 1990). Most recently, Louko, Edwards & Conture (1990) found that among 30 stutterers and 30 age-matched nonstutterers, 40% of the stutterers exhibited articulation difficulties as opposed to 7% of the nonstutterers.

One study that did not support the view that stutterers have a higher incidence of articulation disorders than nonstutterers is that by Seider, Gladstein & Kidd (1982). In their study, informants were questioned about the presence of articulation disorders in stutterers and same-sex nonstuttering siblings. Results showed that stutterers and nonstutterer siblings did not differ significantly in the frequency of associated articulation difficulties. Instead, articulation difficulties occurred most frequently in late talking subjects compared to early (or average) speakers regardless of the presence or absence of stuttering. Findings of this study suggested that language and articulation onset and development may be more a function of familial patterns and gender than of stuttering.

In general, more studies support than refute the finding that articulation disorders frequently co-exist with stuttering in young children. However, an important consideration in reviewing these studies is the variation in assessment methodology. That is, some studies have used direct examination/observation of children's speech production, whereas others have relied on questionnaire data and/or parental reports. This one in addition to other methodological considerations has been highlighted in a recent critique of the literature on concomitant speech and language disorders in stuttering children (Nippold, 1990). These are:

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(a) the use of parental interview or informal observation in place of direct testing of children (e.g., Andrews & Harris, 1964; Darley, 1955; Seider et al. 1982).
(b) the absence of data establishing test-retest and inter-scorer reliability of articulation assessment (e.g., Blood & Seider, 1981; McDowell, 1928; Williams & Silverman, 1968).
(c) the difficulty in distinguishing true articulation errors from manifestations of stuttering (e.g., Schindler, 1955).
(d) the absence of ethnic and linguistic background matching criteria.

A recent study (Wolk, 1990) was designed to overcome some of these methodological concerns, in an attempt to further explore the co-occurrence of S+DP in young children. Wolk compared the behaviours of children who exhibited both S+DP with those of children who exhibited each disorder in isolation. The methods employed were (a) use of the 162-item picture naming task for direct testing of children's speech articulation, (b) intra- and inter-rater reliability measures and (c) clearly developed criteria for distinguishing between true articulation errors and stutterings. Findings from this study suggest that stutterers with phonological concerns exhibit some unique disfluency characteristics (e.g., significantly more sound prolongations) which distinguish them from stutterers without phonological difficulties.

There are also reports of "language delay" in young children who stutter, although this does not appear to be nearly as prevalent in young stutterers as articulation difficulties (Bloodstein, 1987). Furthermore, it is often difficult to determine from these studies whether language delay refers exclusively to syntactic, semantic and/or cognitive factors, or whether it is a more global term including phonological difficulties. The following section provides and overview of studies on language delay in young stutterers.

Language Delays in Children who Stutter

Some investigators have reported that stutterers tend to be slow in developing language (Berry, 1938; Morley, 1957), although the Iowa studies (of nearly 200 stutterers and their matched controls) showed slight or no differences (Bloodstein, 1987). Andrews & Harris (1946, p. 35) speculated that the population groups used as subjects in the Iowa studies tended to be representative of higher socio-economic levels which could possibly explain the difference between their findings and those of other studies.

More recently, Accordi et al. (1983, cited in Bloodstein, 1987, p. 215) found "...retarded language development" in 28 percent of stutterers as opposed to 8.7 percent of a control group. Conversely, Bernstein Ratner & Costa Sih's (1987) results do not support subtle language differences between normal and stuttering children. However, their findings suggest that disfluency breakdown is significantly correlated with gradual increases in syntactic complexity for both stuttering and normal children.

Some studies have investigated the co-occurrence of disfluency with specific syntactic structures in 2-4 year old normally developing children (Colburn & Mysak, 1988a, 1982b; Helmreich & Bloodstein, 1973). Helmreich & Bloodstein found that pronouns and conjunctions appeared in significantly greater proportion among the disfluent words, than did nouns and verbs. Colburn & Mysak concluded that "developmental disfluency was more strongly attached to the syntax of utterances than to the production of particular words" (1982b, p. 421). Further, they concluded that "... the cognitive effort exerted in learning syntactic structures is reflected in systematic changes in speech disfluency in the early language-learning period" (p. 425).

Murray & Reed (1977) reported that preschool stutterers scored significantly lower than their controls on the Peabody Picture Vocabulary Test (PPVT), the Northwestern Syntax Screening Test (NSST), and the verbal abilities scale of the Zimmerman Preschool Language Scale. Kline & Starkweather (1979) found that stutterers (aged 3:0 to 6:0 years) had a significantly lower mean length of utterance (M.L.U.) than did nonstutterers, as well as lower scores on the Carrow Test for Auditory Comprehension of Language. In further support for a language delay, Westby (1979) showed that her stutterers scored significantly poorer than normal speaking children in regard to frequency of grammatical errors, in receptive vocabulary on the PPVT, and in responses on semantic tasks selected from the Torrance Test of Creative Thinking.

In a syntactic analysis of the speech of four stutterers (aged 5:0 to 6:0 years) and four age-matched controls, Wall (1980) found that the stutterers tended to use simpler, less mature language. Conversely, Meyers & Freeman (1985) reported no significant differences in M.L.U. between 4:0 to 5:0 year old stutterers and their nonstuttering peers during communicative interaction with their mothers.

Most recently, Enger, Hood & Shulman (1988) examined both language and fluency characteristics of 20 linguistically advanced preschool and school-aged children (aged 3:2 to 7:0 years). They found that, although these linguistically-advanced children exhibited slightly more frequent disfluencies than would be expected, their disfluency patterns paralleled those characteristics of normal speakers (i.e., interjections and revisions). The majority of their disfluencies were "semantically more filled than empty," occurred internal (rather than external) to the constituent clause, and appeared to be neither physically tense nor highly fragmented.

Thus to date, only limited data are available to support language differences in stutterers, with research results being equivocal regarding the prevalence and specific nature of language abilities between stutterers and nonstutterers.

SOME POSSIBLE EXPLANATIONS FOR YOUNG STUTTERERS' CONCOMITANT SPEECH AND LANGUAGE PROBLEMS

There have been very few speculations about the meaning of young stutterers' concomitant speech and language problems. Furthermore, few of these speculations have been supported with empirical research.

One view, which takes a psychosocial perspective, is that held by Bloodstein (1975, cited in Bloodstein, 1987). He suggested that children with communication disorders are more likely to acquire a sense of failure as speakers and thus learn to struggle with their speech attempts. A second view is that there is a common predisposition underlying the two problems (stuttering and other speech and/or language problems); that is, they are caused by some extent by the same thing (Bloodstein, 1987, p. 221). For example, West, Kennedy & Carr (1947, p. 93) suggested that "stuttering" and "speech retardation" often tend to appear in the same individuals because they have inherited a common predisposition to both conditions. A third view is perhaps a subcategory of the second view, in that both stuttering and associated speech/language problems are speculated to be caused by the same phenomenon: specifically a "central neurological processing deficit" (Byrd & Cooper, 1988). There is some preliminary support for this speculation via empirical research, which is discussed below.

Byrd & Cooper (1988) administered the Blakeley Screening Test for Developmental Apraxia of Speech (STDAS) to 16 young stutterers, 15 developmentally apraxic children, and 15 normal speaking children aged 4:0 to 9:0 years. Results indicated that although significant differences were observed among the three groups on the overall test score (8 subtests), the apraxic and stuttering groups performed similarly on all STDAS subtests except for the articulation subtest. Specifically, they interpreted their findings to provide support for a possible "central neurological processing deficit" in some young stutterers. Also, observations by Yoss & Darley (1974) suggest that in some children, articulatory problems and stuttering might both be manifestations of "developmental apraxia". Among 30 children with articulation problems, sixteen performed poorly on a test of oral apraxia. In addition, these children had more repetitions and prolongations in their speech than did the others. There is still some controversy, however, as to the precise definition of the term "developmental apraxia", and, in fact, as to the existence of this disorder as a clinical entity.

CONCLUDING REMARKS

In conclusion, Bloodstein (1987) recently stated: "There is hardly a finding more thoroughly confirmed in the whole range of comparative studies of stutterers and nonstutterers than the tendency of stutterers to have functional difficulties of articulation, 'immature' speech and the like" (p. 219-220). It seems, then, that the approximately 30-40% prevalence of articulation difficulties in young stutterers is greater than the approximate 2-6.4% prevalence that would be expected in a typical population (Beitchman, Nair,Clegg & Patel, 1986; Hull, Mielke, Timmons & Williford, 1971). Thus, articulation disorders appear to be one of the speech-language disorders most commonly associated with stuttering.

Although much literature is available regarding the nature of speech disfluencies in young stutterers and the nature of phonological difficulties in young children, there is still limited information regarding the co-occurrence of the two disorders in young children. Investigation of this co-occurrence is encouraged since it would appear to have intrinsic value for a deeper understanding of each disorder separately, as well as for the relationship between the two disorders. In addition, we believe such research may have important clinical implications for treating these two coexisting speech disorders.

It is hoped that this review will stimulate research and interest in comorbidity in speech-language pathology, in particular, in the interrelations between stuttering and disordered phonology and/or language delay in young children. Finally, clinicians are urged to give specialized consideration to the diagnostic, treatment and prognostic implications for children who exhibit both stuttering and disordered phonology as opposed to those who exhibit each disorder in isolation.

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